

I.

Born June 16

Aug. 3 - 23.

LC Notes disappear.

Clucks and Squawks appear.

Aug. 23 - 30

RP and/or Trills disappear.

Aug. 30 - Sep. 17

P's disappear

OO Notes appear.

II.

Born July 30

Aug. 20 - Sep. 17

Clucks appear.

P + RP + Trills (and all P?) disappear.

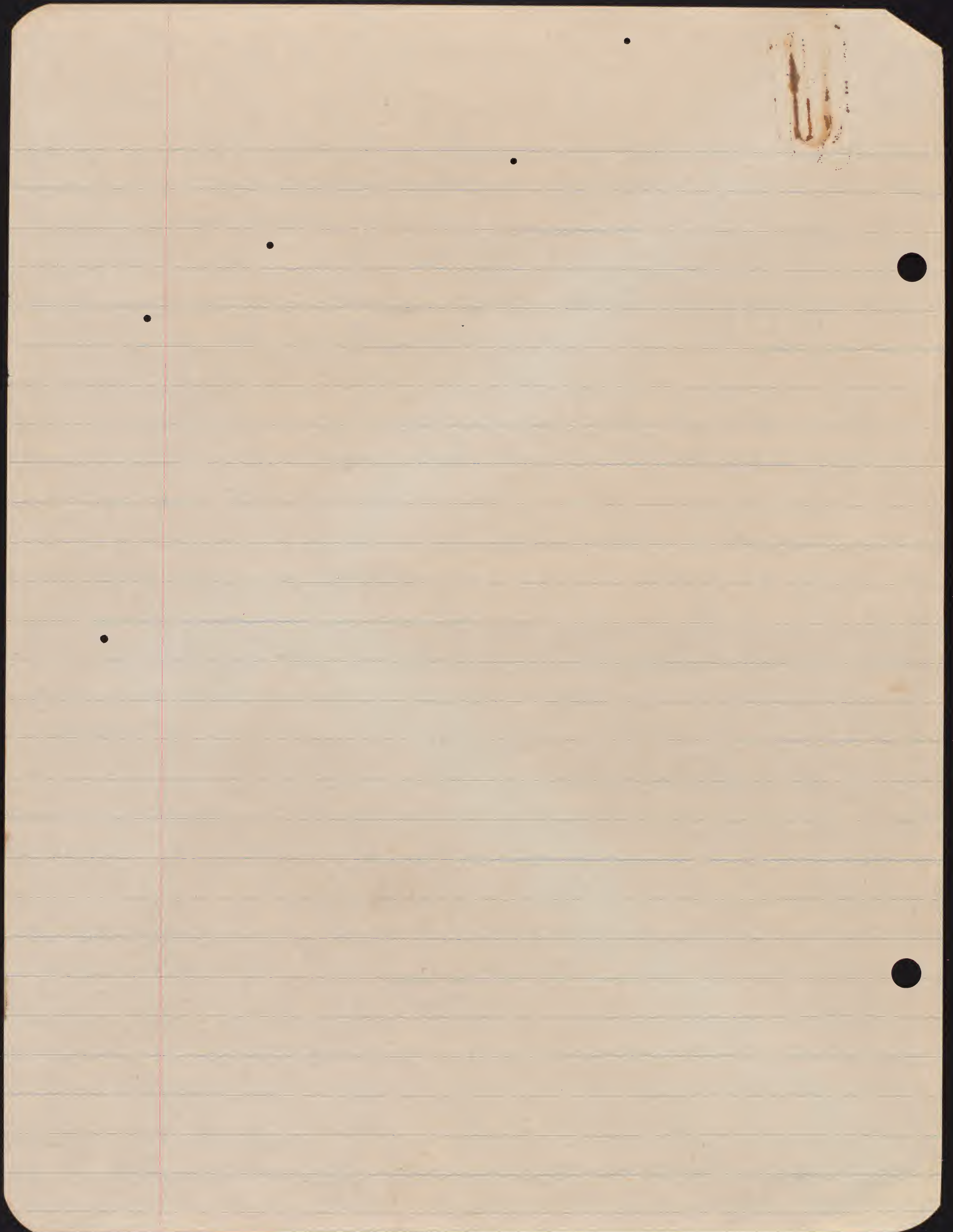
Sep. 17 - 21

LC Notes disappear.

III.

Born September 17

Nov. 19 - 22 Clucks appear.



Araucides cajanea, I

June 17, 1960
Barro Colorado

My pair of captive Wood-rails has finally had a clutch of 4 hatched yesterday (when I was in Balboa, F. I. C.), sometime between 7:00 a.m. and 1:00 p.m. I took them out of their parents' cage before 7:00 a.m. today. Keeping them all together in a cage in the animal house.

They were very shy and upset when we first took them this morning. But they calmed down fairly rapidly. By this evening, I could get them to follow me quite well (although they still show a tendency to panic when I make a sudden vigorous movement).

They are marked as follows: White-head (WH), White-backs (WB), White-rump (WR), and unmarked (UN). Ambrose is keeping the record of their weights.

This morning, when we first took them, they made no attempt to peck at food or anything else. Presumably too upset. So we force fed them. By mid-day, they were pecking at specks on the floor of their cage, and one of them ate meal-worms from a forceps. By afternoon, they all managed to eat a few mealworms and some hamburger from the forceps. But we still force feed them from time to time. They are gaining weight well.

It is obvious that imprinting in this species, if it occurs at all, is either slow and/or easily reversible at this stage.

The only displays of their chicks are vocal. Apparently 3 types of calls. I shall term them the "Lest Call" (LC), the "Alarm Call" (AC), and "Peeping" (P) — at least provisionally.

The LC is composed of long plaintive whistles. Either single, or repeated in series of indeterminate length. Never repeated very rapidly.

A single LC note might be transcribed by something like "Keeeee -
eeee - yoooo"

It is the LC which I termed "long notes" when we recorded the birds this afternoon.

Most LC notes are uttered in quite distinctive circumstances. When a bird is completely isolated. Become louder and more rapidly repeated (up to a certain limit) the longer the bird is isolated.

At least once, an isolated bird which had not yet begun to utter LC's did begin to do so when it heard my voice. Apparently in response. This occurred this evening, after the birds had begun to be fixated on me.

It is just barely possible that the LC is something more, or more generalized, than a simple lost call. Sometimes, although relatively rarely, uttered by a bird standing or sitting very close to its siblings. But such notes may be due to the fact that the bird is separated from its parents. It is also noticeable that such notes tend to be given by a bird which is wide awake while all its siblings are asleep. It is possible that the sleeping siblings are not recognizable as such to the calling bird.

It seems highly probable, therefore, that all the LC's are provoked by some frustration of some "gregarious motivation".

Apart from these occasional LC's, the birds are usually silent when they are near one another in their cage.

Typical ALCN's are quite different from the LC notes. Much sharper and shorter. Often uttered in very rapid series of many notes - like some rather loud and sharp twittering.

These are the notes which I termed "short notes" when we recorded the birds today.

When we first picked up the birds this morning, they uttered lots & lots of ALCN's as we carried them up to the animal house. These notes go

actually declined in frequency and then stopped, but they tended to recur later in the day, whenever I made a sudden movement which alarmed one or more birds. (Tonight, for instance, one bird was following me, uttering LC Notes as it did so, when it suddenly became frightened of me and ran away. It stopped LC Notes and began ALCA's the minute it started to run away.)

Most ALCA's are accompanied by overt running escape movements. When we recorded one bird this afternoon, however, we provoked it into starting ALCA's by poking it. It then continued ALCA's for quite a while, although it was not making escape movements, or, at least, not very vigorous escape movements, all the while. This would suggest that some attack drive is activated in addition to escape when ALCA's are uttered.

Pattern as in the case of the LC Notes, it is still barely possible that some ALCA's are relatively "generalized". When we recorded an isolated bird this afternoon (without poking it), it uttered lots of LC Notes. After a while, after its LC's had increased in intensity, it also uttered brief bursts of 1, 2, or 3 ALCA's, from time to time, in between LC's. But these ALCA's may well have been purely hostile.

(If both some of the LC Notes and some of the ALCA's should be proved to be generalized distress reactions - which I very greatly doubt - then the ALCA's are probably higher intensity than the LC Notes.)

The P patterns are much less conspicuous than either LC Notes or ALCA's. Soft, rather melodious and/or plaintive notes sounding very much like soft abbreviated LC Notes (i.e. LC Notes of the same length as the ALCA's). Usually or always uttered in series of indeterminate length. Some P's were probably uttered by the birds this morning, but I did not become really aware of its existence until around mid-day. It seems to be uttered, at least

most frequently, when all the birds are close together in their box, but awake and jostling one another, and when they are all following me, in a more or less compact little group. The P Notes seem to be the sort of thing which have been called "contact notes" in other species. Possibly produced by mild thwarting of some gregarious instinct (if so, presumably milder than the thwarting producing LC Notes).

The P Notes are slightly variable in sound, varying from something like "Wheet" to something like "Wheoo".

They would appear to be almost exactly intermediate, in actual sound, between typical LC Notes and typical ALCN's. Which might suggest that all 3 types of notes have become differentiated from a single "primary" call or call mechanism (possibly before hatching).

I was not aware that the P Notes were really distinctive when we recorded the birds this afternoon. So they are not labelled on the record in any way. It is possible, however, that one or two P Notes may have been uttered from time to time by either one or both birds we recorded.

The comparatively specific vocabulary of these birds, i.e. the apparent absence of generalized distress notes, would seem to be a very peculiar character.

As far as I can tell, these birds do not have any special food-begging or feeding call. Nor do they seem to have any special threat call (although they do peck at one another occasionally, which may be an indication of hostility).

Their escape behavior seems to consist of nothing more than running away from a disturbing stimulus (and ALCN's). They do not seem to have any sort of crouch pattern!

By this evening, all the birds were performing quite vigorous preening & scratching movements. After being fed.

Amidex caenea, June 17, 1960, I (5)

I forgot to mention that none of the calls of these chicks are accompanied by obvious ritual movements. Most of them are not accompanied by any special movements of any sort. I did notice, however, that some, but not all, of the LC Notes are accompanied by some slight upward raising of the head & neck.

Amidex caenea, I

June 18, 1960
Barro Colorado

The birds seem to be doing well. They are feeding from the floor of their cage from time to time, although most of the time I have to hold their food in tweezers. I have only had to force-feed one bird (V) a couple of times.

I think that their calls today were exactly the same as yesterday, in similar circumstances, but my classification of these calls, as set out in yesterday's notes, may well have been slightly wrong or misleading.

My identification & description of the P and LC patterns yesterday would seem to be correct. The problem involves the "ALCN"s.

I became aware that my treatment of the "ALCN"s yesterday was probably wrong when I tried some experiments with all four birds tonight. I tried four experiments with each bird (while each bird was isolated). I I handled each bird rather roughly - holding it in my hand, turning it on its back, and jiggling it up and down. II I also let each bird stand quietly by itself, far away from me and completely isolated from its fellows, for several minutes. III I also frightened each bird by stomping my foot, suddenly (and sometimes repeatedly) near it. IV Finally I tried picking each bird repeatedly (while it stood or ran on the floor). As a result of these simple tests, I am fairly sure that the notes

I called "LCN"s yesterday really include 2 distinct types of vocalizations

One is a rather harsh, relatively loud "chirp" Note. Uttered singly or in doublets (possibly triplets in some cases?).

The second is composed of much softer and more melodious short notes. Quite like P Notes in general tone. Also uttered in series of apparently indeterminate length (always including at least 5 or 6 notes?). But these series are much more rapid than the series of typical P Notes (each note presumably being somewhat shorter than a typical P Note — and much more rapidly repeated). The general effect of these series is twittering or trilling. I shall call this pattern "Trill".

All 4 birds I tested tonight uttered LC Notes when isolated. But different birds reacted rather differently to the other tests. As follows:

V. gave a few "chirps" when handled roughly. Then uttered Trill's and/or P Notes both when frightened and when poked.

WH. Also gave "chirp"s when handled roughly. Then uttered definite Trill's both when frightened and when poked.

WR. Uttered "chirp"s when handled, and also when frightened and poked immediately after being handled. Then, after being left unmolested for a minute or so, uttered both Trill's and P Notes when frightened and poked again.

WH. Rather more distinctive in behavior. Remained quite silent when first handled. Still remained silent when I poked it repeatedly, still holding it in my hand. Then I put it down on the floor and frightened it repeatedly. All it did was run away, apparently still silent. Then I started poking it. It responded to this by uttering P Notes, and then, as my poking continued, Trill's. Then I picked it up and handled it again — whereupon it uttered "chirp"s!!

I think that the bird we recorded yesterday when isolated probably uttered both "chirp"s and "Till"s (I must check on this tomorrow.) The few "ALCN"s which were uttered between LC Notes by the isolated bird we recorded were certainly "chirp"s. I think that the "ALCN"s uttered by all 4 birds yesterday morning when we first put them in their new cage included both "chirp"s and "Till"s.

As far as the actual sound of all these calls is concerned, it would now seem that both the "chirp"s and the LC Notes are quite distinct — although the LC Notes & P Notes are rather similar in tonal quality. The P Notes and "Till"s are very difficult to distinguish from one another in some cases. They would seem to intergrade with one another.

These facts would suggest the following. I. "Chirp"s are either distress and/or hostile (presumably largely escape). Probably high intensity in either case. II. The LC Notes are certainly produced by frustration of some sort of gregarious or "infantile" motivation. III. The P Notes are probably produced by mild frustration of some gregarious or "infantile" drive, and/or (less probably) are mildly hostile. Rather unlikely to be distress notes. IV. The "Till"s may be produced by much the same motivation as the P Notes, but are obviously more strongly hostile. If both the P Notes and the "Till"s are produced when some gregarious motivation is thwarted by hostility, then the hostile drives (escape predominant) are obviously stronger, on the average, in the "Till"s. It is also conceivable, however, that the "Till"s are the direct result of activated hostility alone (i.e. gregarious motivation is "irrelevant" in their production). Like the P Notes, the "Till"s are unlikely to be pure distress notes.

All the birds still seem to lack anything like threat or feeding or food-buzzing calls.

Ammodramides cacauea, I

June 19, 1960
Barro Colorado

This afternoon I noticed that all four birds uttered Ill's when they were feeding all together in a rather compact little group, with some foraging. Later on, they uttered Peeps when huddled together, preparatory to sleeping.

This evening I ran the same series of tests as yesterday, and also let each bird follow me alone, without being able to see any of the other birds. The results were as follows.

V Quite silent when handled roughly. Then uttered Peeps when following me. Then uttered Peeps when isolated! These Peeps when isolated were not continuous, V would stand silently for a while, then utter a few Peeps, then fall silent again, etc. etc. It was particularly apt to utter a little burst of Peeps when isolated when it could hear my voice, when I called to it after a few minutes or seconds of silence. After it had been isolated for quite a while, V uttered a few, not very loud, LC Notes in addition to Peeps. Then it uttered more Peeps when frightened. Finally, it uttered Ills when jolted (these Ill's were particularly similar to Peeps in general effect).

WH I picked up WH and handled it particularly roughly. It uttered several chirps, and then 1 Peep and 1 LC Note, during this handling. Then it uttered more chirps as I continued to handle it. Then it uttered a few LC Notes (not very loud and by no means continuously) when isolated. This is all the testing of WH we did tonight, as it seems to have developed a lump.

WB Uttered one or two chirps when handled. Then uttered Peeps when following me. Then remained quite silent when isolated. Then uttered

uttered chirps when frightened — and also 1 Peep and 1 LC Note!
Then uttered quite a lot of Peeps and Trills, and at least a couple of Chirps when poked.

WR uttered a few chirps, after a considerable period of silence, when handled roughly. Then uttered Peeps when following me. Then alternated periods of silence with a few LC Notes when isolated. Particularly apt to utter LC Notes when isolated when it could hear my voice. Then uttered Trill's when frightened. Then uttered Trill's, Peeps, & chirps when poked.

These tests would seem to indicate that my previous interpretation of the calls of these chicks were approximately correct. The LC Notes are certainly lost calls. The chirps and Trill's may be high intensity distress, or, much more probably, hostile. The chirps are presumably higher intensity hostility than the Trills, and/or contain a relatively strong or escape component.

The Peeps and Trills are so similar in sound that I would have said that the Trills were nothing more than a high intensity version of Peeping, were it not for the fact that they occur in rather different circumstances. It is possible that the Peeps may be very mildly hostile (lower intensity than the Trills or chirps), or the result of frustrated gregariousness, or generalized distress notes.

If the Peeps and Trills and chirps are all hostile, the behavior of the chicks when handled would indicate that the hostile motivation of these 3 patterns is qualitatively (rather than quantitatively different). A chick being handled is usually silent until it utters chirps. It does not usually utter a "crescendo" of calls, i.e. Peep → Trill → Chirp.

There is no doubt but that the birds uttered LC Notes much less frequently when isolated tonight than when they were isolated on

previous days. Perhaps the LC pattern is in process of disappearing — at least temporarily (like the corresponding pattern of the Junco)? Or maybe the birds just don't feel as "lost" when isolated now as earlier (Their eye sight is certainly improving. They forage now from at least 10-20 ft away.)

It is possible that chirps are also becoming slightly rarer. It was my impression that the birds uttered fewer chirps when handled tonight than yesterday. At least, they had to be handled more roughly and/or for longer periods of time before they would utter chirps.

In the normal course of events, when they are all together in their cage, they utter only Peeps and Trills now. No chirps or LC Notes.

They are feeding from the ground quite frequently now.

I noticed one peculiar reaction tonight which I have not described before. When a bird is handled, especially slowly when it is held on its back or upside down, it frequently shakes its head repeatedly, and more or less rapidly, from side to side. Often quite vibratory in general effect. Always quite silent (at the same time, the neck is usually stretched upward and/or forward — presumably an attempt on the part of the bird to "right" itself.) This shaking always stops when the struggling bird utters chirps, but is usually resumed immediately after and between chirps.

This shaking was performed by the birds when handled yesterday as well as when handled today.

I don't know what its significance might be. It doesn't look like a display — yet.

Chondestes cayana, I

June 22, 1960
Barro Colorado

The birds seem to be getting along quite well now. Growing. Still don't like to feed themselves (if they can help it). When isolated this morning, they did not follow me as enthusiastically as they did a few days ago. Possibly because they haven't had much practice recently.

When sitting or standing peacefully in their cage, they usually utter Peep Notes, and nothing else. The Peep Notes uttered in such circumstances are relatively long, although always or almost always appreciably shorter than LC Notes. They are most like LC Notes in tonal quality, however. More so than otherwise similar Peep Notes uttered in association with chirps or fills (see below) when handled or poked or frightened.

Peep Notes still seem to intergrade almost perfectly with Fill's. The birds also utter quite a lot of notes which are almost perfectly intermediate between typical Peep Notes and typical chirps. Surprisingly enough, in view of the tonal similarities between typical Peeps and typical LC Notes, intermediates between typical Peeps and typical LC Notes are either relatively rare or non-existent.

I tried the usual series of tests on all 4 birds this morning around 8:00 a.m. Also another test. Speaking to a bird isolated by its self in a box. A bird will often answer my voice in such circumstances. I shall call such answers "greetings".

The results of these tests were as follows:

WR gave a few LC Notes when isolated. Uttered Peep Notes as greeting. Uttered a few chirps (not very extreme, i.e. relatively soft and not very harsh), followed by some Peeps, when handled. Gave very extreme chirps, i.e. very loud and harsh, when poked. At the same

a time that it uttered these harsh chirps, it made very extreme escape movements. Running away from me madly. I let it rest a few minutes, and then started to pick it again. This time, it uttered a few extreme chirps, followed by some not very extreme Tills (the notes of these Tills were not very accelerated, somewhat like series of Peep Notes), and made less frantic efforts to escape. I stopped picking the bird, and then tried to frighten it. It did not seem to be greatly impressed by most of my attempts. Remained silent most of the time, but finally uttered one Till. Later on I gave it a chance to follow me. Although it only followed very occasionally, it did utter Peeps when it did so.

WH. Remained quite silent when isolated. Then uttered Peeps as greeting. I kept it isolated for some minutes more, until, finally, it did utter a few LC Notes, occasionally interspersed with rather harsh, chirp-like, Peep Notes. Then it uttered Tills when picked. Also uttered Tills when frightened. Later on, it uttered Peeps when following.

WB Remained quite silent for a long time after being isolated. Then finally uttered a few LC Notes. Then it uttered a few LC Notes as greeting. Later on, it uttered Peeps as greeting. When handled, it also remained silent for quite a long while. Finally uttered 1 chirp and several Peeps when I continued to handle it. It would not follow me well, but did utter Peeps whenever it followed at all. When I frightened it, it uttered one chirp and then remained silent.

V Like the other birds, V remained silent for a long time when isolated, and then uttered a few LC Notes. Uttered Peeps as greeting. It also tried to jump out of the isolation box repeatedly. It always uttered loud chirps as it did so. (This might be a very good indication that the chirps are distress notes rather than expressions of hostility.) This bird followed me rather well, uttering Peeps as it did so. It

uttered Trills when frightened. These Trills were accompanied by vigorous escape movements. Then it uttered chirps when handled. Finally, it uttered Trills when poked.

It is obvious that the vocal repertoires of these chicks have changed surprisingly little since I first began to study them. The LC Notes don't seem to have declined any more during the last few days.

They still don't perform any ritualized postures or movements.

They still shake the head laterally when handled upside down or on their backs, but this doesn't seem to have developed any further.

All the calls are always uttered with the bill absolutely closed.

Arremonides cacauea, I.

June 24, 1960
Barro Colorado

The behavior of the birds doesn't seem to have changed at all yet.

I just ran tests on 2 birds this afternoon

WH. Uttered chirps and then Peeps when handled. Then uttered Peeps when following me. Then uttered LC Notes when isolated, and Peeps as greeting. Finally uttered Trill's, both when poked and when frightened. All this was perfectly conventional.

V. Remained quite silent when handled. Then uttered a few Peeps while following me. Then uttered 1 chirp, followed by a few Peeps, when poked. Then uttered 1 Peep when frightened. Surprisingly enough, it remained quite silent when isolated for quite a long time. Then it uttered 1 Peep as greeting. Finally, it still remained quite silent when isolated again for a long time.

The fact that V uttered quite an appreciable number of Peeps d

During these experiments, while uttering only 1 chirp and no Trills or LC Notes, would suggest that the Peeps are lower intensity, on the average, than any of the other notes. It might also suggest that the Peep is a generalized distress pattern. (The only other plausible explanation of V's behavior today is that it was frightened - for some reason - and that fear inhibits all the other calls but not Peeps. This seems to be much less likely.)

Arremonops canescens, I. June 27, 1960
Barro Colorado

The behavior of the birds has changed surprisingly little. They are now shy-er and more "skittish", more apt to break into sudden panics, than before. This may be an inevitable development, but it may also be due to the fact that I have been paying relatively little attention to the birds recently. They may have "forgotten" me.

They still utter Peeps when all huddled together. We tried the usual series of tests on them immediately after lunch. W.H. Remained silent for a long time when isolated (in a dark box). Finally uttered an occasional Peep after being isolated for at least 5 minutes. Then uttered a few Peeps as greeting. Then, after being isolated (in the dark) for several more minutes, it finally uttered one LC Note. Then it uttered chirps when handled. Then it uttered quite a lot of LC Notes when isolated again (in the light). Then it uttered Peeps when following me (it did not follow me well, or for a very long time, but it did at least attempt to follow me occasionally). Then it uttered Peeps and Trills when picked. (Some of the Peep Notes

es were unusually loud & long in such circumstances. Such notes may have been "transitional" to Chirps, but they were not at all harsh. Then it uttered Trill's when frightened.

V Remained silent for quite some time in the usual way, when isolated (in the light), and then uttered a few LC Notes. Then uttered a few Peeps as greeting. Then uttered a few Chirps when handled.

This bird would not follow me at all.

It uttered Chirps, and then Peeps, when frightened. Then it uttered more Chirps, followed by a few Peeps, when poked. No Trills at any time!

The fact that this bird did not follow and did not utter Trills might suggest that the Trills are uttered when some gregarious motivation is activated in addition to, and in conflict with, hostility.

WR Remained silent when first isolated (in the light) and then uttered quite a lot of loud LC Notes. Uttered both LC Notes and Peeps as greeting. Remained silent when handled, except for one brief Peep. Uttered a single chirp when picked up a second time. Then uttered Peeps when following me (very briefly and poorly). Also uttered Peeps when running away from me. Then uttered Chirps when frightened, and both Chirps & Peeps when poked.

This bird would also appear to have lost or be in process of losing the Trill pattern.

WB Uttered LC's when isolated. Then uttered Peeps as greeting. Then uttered Peeps when following me (although this following was not close or long-sustained). Then uttered Trills and Peeps when poked. Then utters Trills and Peeps when frightened. Then utters Chirps when handled.

Ammodramus cafer, I.

June 30, 1960
Barro Colorado

Did the usual series of tests with this bird this evening.

V. Uttered chirps when banded. Then started to utter Peeps immediately when isolated. Then fell silent. Then uttered more Peeps as isolation continued. Continued to utter Peeps when I spoke to it, but I can't be sure if these were greeting or not. Eventually it began to utter LC Notes after being isolated for at least 5 minutes. Then it definitely did utter Peeps as greeting when I spoke.

All these Peeps uttered by V when isolated and as greeting were relatively long notes and relatively "well-spaced", i.e. there were relatively long periods of silence between successive notes.

Then V uttered Peeps when running, both when following me and when running away from me.

The Peeps it uttered when running away from me were apparently identical with the Peeps it had uttered when isolated and as greeting; but the Peeps it uttered when following me were shorter and more rapidly repeated.

Then V uttered chirps, Peeps, and Trills (these Trills were not very different from Peeps) when poked.

Then uttered moderately long Peeps, at moderately long intervals, when standing by itself (not in a box). Then, when I approach, it runs away. As soon as it starts to run away, it begins to utter Peeps more rapidly. These Peep notes were similar to the ones it had been uttering when standing alone, but somewhat louder and much longer. Possibly a distinctive form of "Alarm Peep"?

Then V uttered Hills when poked, and also when frightened. In both cases, the Hills were very much like Peep Notes, with only a very slight, initial, trilling quality. Comme ça:

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These reactions by V would certainly suggest that the vocal repertoires of these birds are just about ready to change. The Hills would seem to be becoming less differentiated. More important, the Peep Notes may be developing into several different kinds of patterns.

I think that the relatively long Peeps uttered by V when isolated and as greeting were longer than the usual Peeps uttered by the 4 birds a few days ago. And the "Alarm Peeps" are certainly quite distinct morphologically.

WH. Utters Peeps and then 1 chirp when handled. Then utters rather short Peeps when running away from me. Then remains silent for a long time when isolated. Then utters a few LC Notes as isolation continues. Then tries to jump out, repeatedly. The LC Notes stop as soon as jumping begins. Then utters single, more or less undistinguished "medium" Peeps as Greeting.

Then utters moderately short and moderately rapid Peeps, both when following me and when running away from me.

Then utters the same type of Peeps when frightened.

Then utters perfectly typical Hills when poked.

This bird may be somewhat retarded ??? Not only can it utter perfectly typical Hills, but it also showed a definite tendency to follow me very well and closely from time to time. This might conceivably explain why its Peeps seem to be less "differentiated" into different patterns than those of V.



WB Utters Peeps and chirps when handled. Remains silent at first, and then utters Peeps, when isolated. Then utters LC Notes as isolation continues.

Then utters Peeps, accompanied by Isli's (see below), as greeting. Again.

Then utters short but not rapidly repeated Peeps when running away from me.

Then utters the same type of Peeps when following me (very briefly and badly).

Then utters a few single, rather chirp-like, Peeps when frightened. Then utters both Peeps & Tills when poked.

WR. Utters chirps when handled. Then utters LC Notes immediately when isolated. Then utters ordinary Peeps (quite like those uttered by all the birds a few days ago) as greeting. Then utters similar Peeps, perhaps somewhat louder & more rapid, when running away from me. Shows no tendency to follow me. Then utters 1 Till, followed by lots of chirps, when poked. Then utters ordinary Peeps when frightened.

Both WH and WB performed quite a lot of single Isli's when isolated at various times. Usually or always silent in such circumstances (see also account of WB above). These movements did not appear to be ritualized or exaggerated in form, but I have not noticed them in such circumstances before, and I think that they may have been produced by something other than "comfort" motivation.

The fast, repeated, lateral head-shaking or trembling performed by birds held upside down or on their backs seems to have disappeared almost completely now. Apparently it was not a signal of any sort.



Ammodramus cajana, IJuly 2, 1960  
Barro Colorado

I just happened to look into the cage where the 4 birds were, and saw WR performing "Tail-cocking" Movements ("ck"), just like those of adults. At least 7 or 8 of these movements, in more or less rapid succession. Both when standing still and when walking slowly around the cage, apparently looking for food.

These ck Movements seem to have appeared fully-formed. Completely de novo. Certainly not a case of ontogenetic ritualization.

It may be significant that the tips of the tail feathers (and the primaries and secondaries of the wing) are now fairly conspicuously free of their sheaths.

Ammodramus cajana, IJuly 5, 1960  
Barro Colorado

Started to watch and experiment with the birds around 7:30 this morning.

Spending a lot of time more or less huddled together in their cage. Occasional periods of walking around and feeding. They still seem to be quite gregarious inter se, but it is not uncommon to see 1 or 2 birds get up to feed by themselves without being followed by the others.

Their wing feathers are developing quite rapidly.

They still utter lots of Peeps in their cage. When huddled together and (perhaps more frequently?) when walking about in a more or less scattered way. All or almost all their Peeps are relatively long and plaintive-sounding. Exactly intermediate between short Peeps and typ



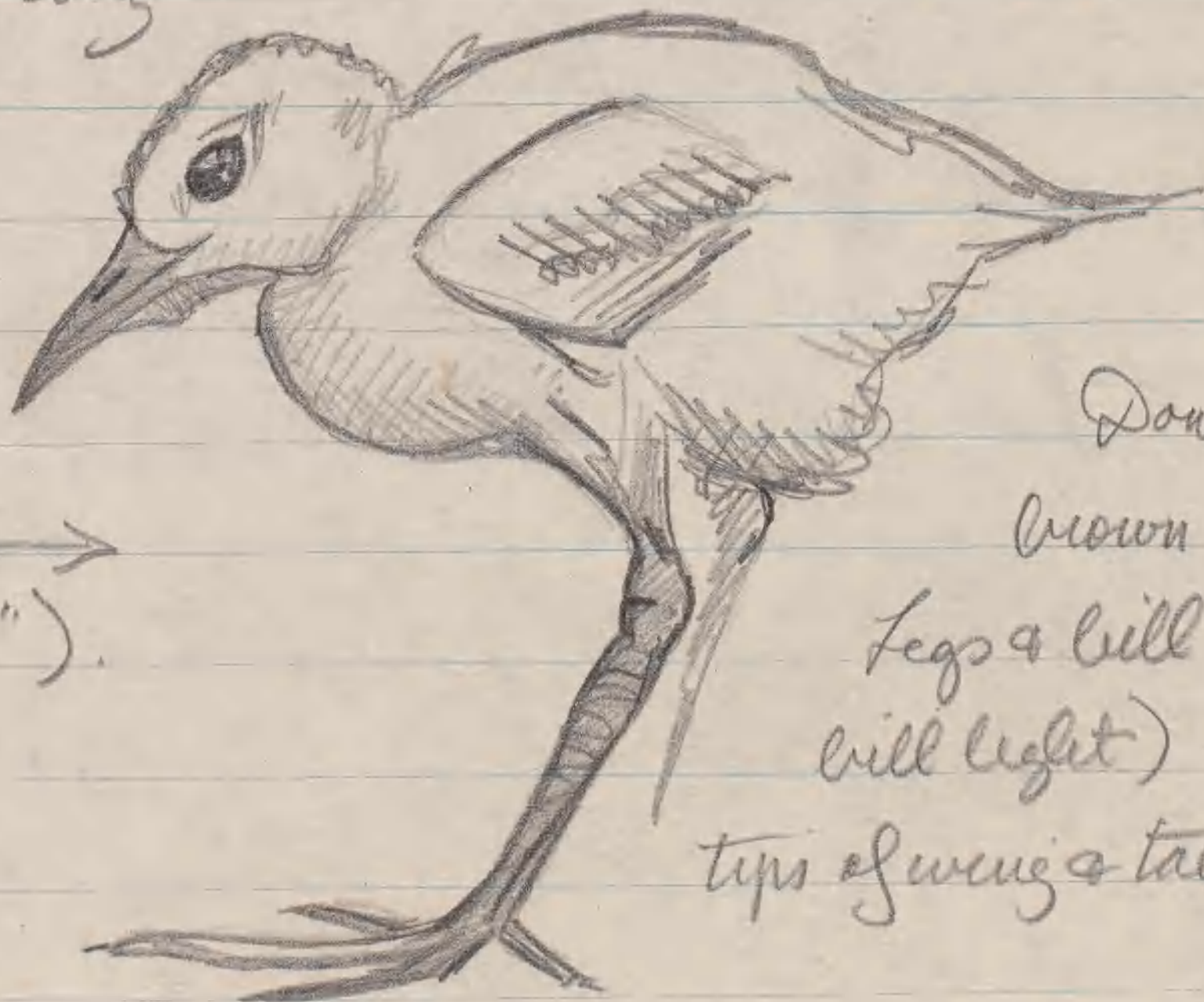
usual LC Notes. Possibly produced by more or less intermediate motivation. Shunting of some gregarious motivation — without hostility.

CK's occur quite frequently now, in some circumstances, but are certainly by no means continuous. While I watched this morning, WR did a lot of CK-ing when just walking around the cage, and WH performed a number of CK Movements while sitting down. I thought that CK Movements might be an indication of "nervousness" of some sort (alarm?), but this interpretation is very tentative and quite probably dubious. In any case, the birds frequently walk and run around without the slightest trace of CK Movements.

I started to run a series of tests this morning.

WH. Uttered chirps when handled. Silent when first isolated, and then began to utter LC Notes of the usual sort. Uttered a series of rather varied and variable Peeps (see descriptions below, p. 21), as greeting. Also performed a couple of Loh's, and 1 burst of Tail-wagging ("TW"). These latter movements may have been "autochthonous", as the bird immediately began to preen vigorously when I walked away.

While the bird remained isolated (in a box), I returned to talk to it several times. Almost every time I talked to it, the bird lowered its head, and assumed a "semi-crouch" posture (see fig. →). I shall call this "SC").



Down medium dark brown now. Eyes black. Legs & bill blackish (tip of bill light). Newly exposed tips of wing & tail feathers rufous.



Some of these SC's were accompanied by a variety of Peeps, apparently by also greeting, but others may have been largely or completely silent.

All the Greeting Peeps, both with and without SC, were quite irregular. Some short and soft Peeps were uttered in accelerated series, almost like Trill's. These were intermingled with longer and more plaintive Peeps, like those uttered by all the birds when they are together in their cage.

This bird wouldn't follow me at all, at first. It just ran straight away from me. It uttered variable and irregular series of Peeps as it ran away (I couldn't hear these Peeps well, but I think that all or most of them tended to be short and soft). After a while, however, the bird did follow me for a short distance. It uttered a rapid series of short soft Peeps as it did so. Then it stopped. Immediately became silent and Ch'd twice. Sign of "indifference"? Then it followed me again. Again uttering rapid series of short soft Peeps. Stopped again. Performed 4 Ch movements, one right after the other, apparently silently. Then starts to follow me again, as before.

It uttered a lot of chirps when I started to pick it. These were intermingled with quite a lot of rather obscure soft short notes. Probably not very distinct Trills. Hardly distinguishable from accelerated series of short soft Peeps.

When I tried to frighten the bird, by stamping my foot next to it, it usually responded by running away. Sometimes silently. Sometimes with chirps. Sometimes with fairly soft and short, not particularly distinctive, Peeps.

From time to time, during this period of experimenting, the bird was left alone and unmolested on the floor. Every once in a while, under these circumstances, it would perform an Trill, when sta



ending still. I don't know what these meant.

This evening I ran off some more experiments with a couple of other birds.

WR Remained silent for quite a long time when handled very roughly. I am now coming to the conclusion that a badly frightened bird always or almost always does remain quite silent.

Finally, as the handling continued, the bird uttered 2 chirps. These were very loud and harsh.

Then it started to utter loud LC Notes almost immediately upon being isolated, (in a box).

Uttered Peeps as Greeting. The first Greeting Peeps were short & fairly soft. The later ones were relatively long and plaintive, like those uttered by all the birds when they are together in their cage. I continued to talk to the bird for quite a long time, uttering a series of not-very-rapid "Hello"s. The bird continued to respond by Peeps. Finally, it also responded, twice, by performing an Lh just after I uttered a "Hello". Each Lh was accompanied by a single relatively long and plaintive Peep (I think I shall call these "PP").

I then left the bird alone in isolation for quite a long while. It continued to utter LC Notes. Also a lot of moderately short and soft Peeps (definitely not PP).

Then I reached my hand into the box to start to pick it up. The bird tried to run away, and began to utter very long and loud Peeps. Quite shrill and high-pitched. Not plaintive. These were probably essentially the same as the "Alarm Peep"s of V described above on June 30, 1960, p. 16. The individual notes were so long, however, that the whole series did not give the impression of being uttered very rapidly.



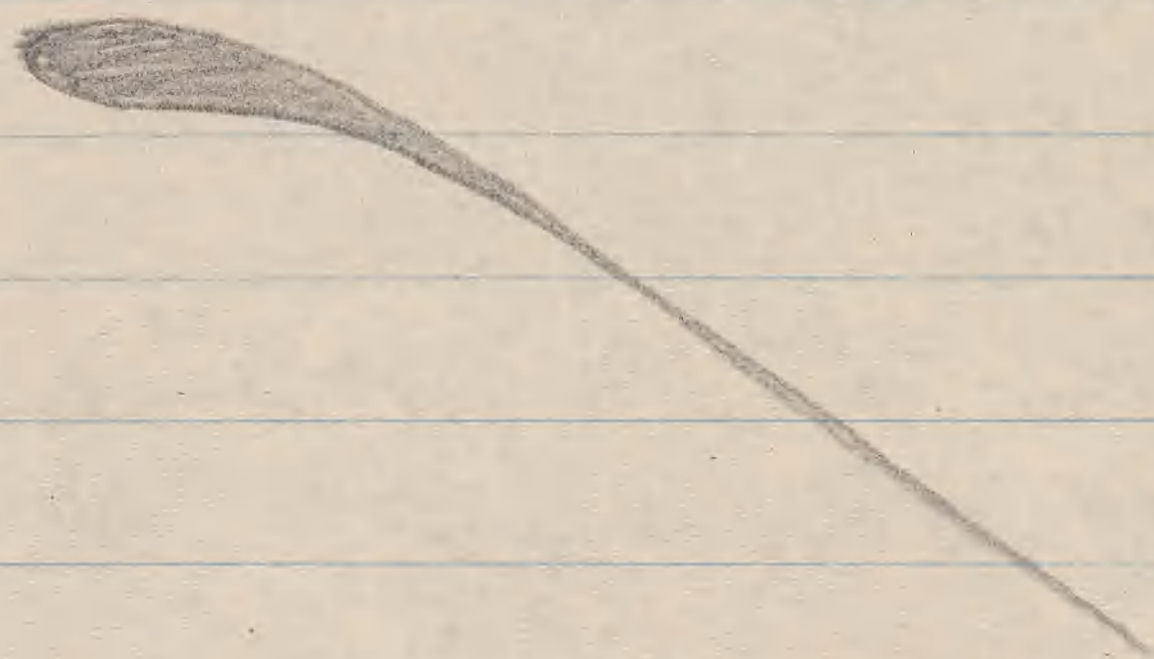
The first series of these Alarm Peeps ("ALP's") might be transcribed by something like "Whereeeeeee Whereeeeeee-eeeee Whereeeeeee  
eeeeee . . . . ."

When I reached my hand into the box a second time, the bird uttered more ALP's. These may have been slightly different from the notes of the first series. Each note might be transcribed by something like "Whereeeeeee-eeeee-oo"

All these ALP's were quite distinct from the similarly long LC Notes. Typical LC Notes might be represented by the following diagrams:



Or, perhaps better yet:



After this I put WR down on the floor. It stood still for a few seconds. I began to talk to it. It began to perform numerous Isi's. Most of these Isi's, but by no means all, were synchronized with my words. The whole performance made me think of the Tuiwau's reactions to "Ooooooo" sounds.

When I started to move around, WR followed me very well.



Twice. Each time uttered long, rapid series of short, soft Peep Notes. Then it stopped. Performed one silent Flt. Then ran away, uttering exactly the same Peep Notes as when it was following me. I think that such Peeps cannot be an indication of either gregariousness (or infanticide motivation), or escape. Must be essentially nothing more than locomotor intention movements. I shall call them "Running Peeps" (i.e. "RP"s).

This bird later remained quite silent when frightened.

Then uttered a few Trill's (not very distinct), and quite a lot of Peeps (including AOP's, and fairly soft short notes - perhaps an indication of RP) when poked.

Then it became absolutely silent when held firmly in my hand.

✓ Uttered a few soft, very Peep-like chirps when handled.

Then uttered a few soft short Peeps when following me, for short distances, from time to time. Not many. Much of the time the bird followed me it remained quite silent.

Then it uttered the same type of Peeps, with much the same frequency, when running away from me.

These Peeps when following and running away from me must have been very low intensity and/or imperfectly developed RP.

✓ Then began to utter typical LC Notes almost immediately when isolated (on the floor).

Then uttered quite un-distinctive short Peeps when handled again. Single notes, not series.

Then uttered rapid series of short soft Peeps, and Trills, when poked. Then, when frightened, ran straight away from me. Obviously high intensity escape. At first this running escape was quite silent, but then, after the bird had got some appreciable distance away from me, but was



still running fast, it began to utter ordinary RP as it continued to run.

From time to time, during this series of experiments, I let the bird alone, on the floor of the animal house, free to do what it pleased. It spent much of this free time running rapidly hither and yon. None of these "runs" were very long-sustained, however. The bird always stopped for a pause of a few seconds or minutes after it had run for a few seconds. It uttered lots of RP and an occasional LC Note while it was running; but always fell silent when it stopped. In addition, it almost always performed 1 or 2 Lh's as soon as it stopped. Usually but not always accompanied by TW. Usually but not always followed by a lot of more or less complete preening. (I think that the Lh must be the usual introductory movement of complete preening. All the Lh's and preening of V tonight appeared to be quite autochthonous. Perhaps all the Lh's of all the birds, so far, have been completely autochthonous. It may be significant that Lh's first became conspicuous at approximately the same time that the wing and tail feathers began to burst out of their sheaths. It may be very advantageous for a bird to preen as much as possible at this stage.)

Once, when I stretched out my hand toward V, while it was free on the floor, it ran away, uttering relatively long & loud, but not plaintive, Peeps. There may have been ALP's; but they were not as long, nor as loud, as the ALP's of WR earlier tonight. And these notes of V's definitely became shorter and softer, more like typical RP's, as the bird got further away from me.

Eventually, I tried isolating V in a box. All it did was utter a few short, soft, single Peeps, and then go to sleep!

I then went and woke it up (after it had slept for about 5 minutes). Whereupon it began to utter quite typical RP's!



I think that the "Peep Complex" of these birds, at this stage, can be divided into the following more or less distinct patterns:

1. RP. Presumably a pattern of moderate intensity. Almost certainly completely non-hostile. Possibly produced by moderate thwarting of moderately strong gregarious motivation.

2. ALP. Obviously hostile. Obviously produced when the escape drive is much stronger than any counter-acting motivation (but not as relatively strong as when a bird is escaping silently).

3. RP. This is a puzzle. Probably not essentially hostile. Probably purely a locomotor intention movement. Produced when a bird is trying to get somewhere but hasn't got there yet?

4. Jills. These sound like nothing more than exaggerated RP. But they do seem to be hostile. They might, nevertheless, be nothing more than high intensity RP. Perhaps it is only in hostile circumstances that these animals want to go someplace very strongly without being able to get there ??? In any case, the hostility usually associated with Jills seems to be largely or completely escape (see below). But escape may be relatively less predominant during Jills than during ALP's.

It is possible that these birds also (or still) have a 5th category of Peeps. Single notes of not very distinctive quality. Not very long or loud or plaintive. Presumably low intensity. Possibly a low intensity generalized distress pattern. Or perhaps these anomalous Peeps are really heterogeneous. Low intensity versions of all the other Peep patterns. (These last 2 alternatives may actually be 2 different ways of describing the same thing.)

I have yet to see these birds perform anything like unmistakable attack or predominantly aggressive patterns. Rather wary, as



Chamides cajanica, July 5, 1960, IX

(27)

adults of this species are certainly very aggressive.

Neither of the birds I tested tonight performed CK Movements during the periods I watched them. Why?

Chamides cajanica, I

July 7, 1960  
Barro Colorado

This evening I let all the birds run around loose on the floor of the animal house for at least a half hour. Just to see what they would do. They did not behave very differently from when they are in their cage, except for the fact that they ran more — presumably because they had more room in which to run. I noticed only a few interesting reactions.

None of the birds performed any CK Movements at any time. This is quite surprising.

Several of them did, however, perform a tail movement which I had not seen before. A strictly vertical TF — always D-V. Sometimes this occurred by itself alone. At other times, it developed into TW. Perhaps it is nothing more than the lowest intensity intention movement of TW.

The birds uttered almost as completely the same range of Peeps when they were free on the floor as when confined in their cage. Mostly undistinctive Peeps and RP when standing still or moving very little, mostly RP when running.

Once, they all spent quite a lot of time chasing & pecking at the same insect. This was accompanied by lots of rapid, short, soft Peeps. Some of this Peeping was certainly RP. Part of it, however, was even more rapid. Seemed to be perfectly typical Hlls!!!

It is possible that these Hlls were an indication of party aggress-



no hostility between the chicks. If so, they were the only indication of such hostility this evening. At no time this evening did the chicks ever peck at one another in an aggressive manner.

I also ran a series of tests on WB this evening.

• WB. Uttered chirps when handled.

Silent when first isolated in a shallow box. Jumps out. Put back in box, jumps out again. All quite silent. Finally begins to utter LC Notes after jumping stops.

Repeatedly performed Lsh's, as "Greeting", when I talked to it (while it remained isolated in the box). A single Lsh each time I said "Hello". Some, but not all, of these Lsh's were accompanied by TW. All these movements were quite silent. Then, when I uttered "Hello" again, once, it uttered a single un-distinctive Peep, without any movements. Then, when I uttered more "Hello"s, it resumes performing Lsh's, with or without TW's, as Greeting each time; and all these later Lsh's were also silent. Finally, when I stop saying "Hello"s, the Lsh's continue for a few seconds, and then develop into complete preening.

WB then followed me twice, quite well. Uttered a form of RP during this following. Quite like the RP of other birds I tested yesterday and earlier, but the individual notes were somewhat longer. It then uttered the same form of RP when running away from me.

Several times, when I approached WB (on the floor) slowly during this series of experiments, it assumed a silent SC Posture - exactly like the posture drawn above on July 5, p. 20. Usually momentary, followed by relaxation or running away. It also assumed the same SC once when a bat flew particularly close to it.

When I frightened WB by stamping my foot, it always ran



Ammodramus cafer, July 7, 1960, III. (29)

away from me. Sometimes silent. At other times uttered the same form of RP described immediately above.

When I started poking it. At first it remained silent when poked, and then began to utter single Peeps. These Peeps became more & more chirp-like as the poking continued, and finally developed into perfectly typical chirps.

Ammodramus cafer, I.

July 10, 1960  
Barro Colorado

This morning, I happened to go by the Wood Rail cage, and WB looked at me alertly (without assuming any special ritualized posture), performed about 4 rapid CK Movements, and then ran away from me. This would seem to be a further indication that the CK contains a strong escape component.

Ammodramus cafer, I.

July 12, 1960  
Barro Colorado

The birds' behavior has changed very little, in spite of the fact that they are becoming quite well-feathered now. Except that they are becoming shyer and shyer, (this increasing shyness may be largely or completely due to the fact that we have not been with them very much recently).

They still give the same RP when all together in their cage.

I tried the usual series of experiments with 2 birds tonight.

WH Remained quite silent, for a long time, when first isolated (in a box). Then uttered 1 chirp, and assumed a definite SC Posture.



when I looked into the box. I immediately retreated and left the bird alone again. It then began to utter a series of notes, each note apparently intermediate between a typical PP Note and a typical LC Note.

Then I started to talk to the animal. It uttered 1 chirp and assumed an SC Posture when I first began to talk, but then came out of the posture and uttered a few single undistinctive Peeps as I continued talking. I retreated again after a few seconds.

The bird then tried jumping out of the box. Repeatedly. This jumping was accompanied by sharp chirp-like single Peeps. Possibly a form of, or related to, ALP's (see below)???

Then the animal stopped jumping and stood quietly for some minutes; at which time it began to utter quite typical LC Notes.

Then the animal repeated the whole performance, jumping with chirp-like Peeps, and standing with LC Notes, once. Then started jumping again, this time silently.


I finally put my hand into the box. The bird responded by assuming an extreme crouch posture. The head was lowered as in the usual SC; but the legs were bent so that the bird was actually sitting on its tarsi. It stayed in this posture for several seconds, while I kept my hand quite close to it. I think that I shall call this extreme crouch posture "XC". When the bird first went into the XC, it uttered a whole series of chirps. These gradually changed into ALP's. The intergradation between chirps and ALP's was so perfect as to suggest that the ALP Notes are little or nothing more than intermediates between typical Chirps and typical undistinctive P Notes.

I then pulled the bird up and handled it rather roughly. It uttered chirps, ALP's, and undistinctive P's during this handling.

Then I put the bird down on the floor, outside the box. It stood



quite still, and quite silent. For several seconds, only performing repeated CK Movements! Another indication that the CK is an alarm pattern.

I noticed a few more details of the actual form of the CK. It is a completely vertical U-D TF. Somewhat complicated, however, by the fact that the tail is partly raised before and between the TF's. In other words, the tail is first raised to a position comme ça:  and then (after a variable pause) the U-D movement is superimposed upon this initial raising. (This initial raising may be nothing more than an intention movement of the U-D TF.)

Then the bird ran away from me. Uttering a few soft, not very rapid or short Peeps. The general effect of these Peeps was rather different from that of RP I have heard on previous days, but I suppose that they must have been some variation of RP (possibly low intensity?). Then the bird stopped. I approached the bird a little more closely, and it ran away again. This time it ran off with more of the same type of soft Peeps, plus ALP's & chirps.

The bird would not follow me at all.

I tried approaching it again & again. Rather to my surprise, it also seemed to be somewhat reluctant to run away from me. Tended to assume an SC Posture instead. All these SC's were silent. I finally persuaded it to do a little more running away by giving it soft pats on the dorsum. It would stand in a silent SC; then, when I patted it, it would first utter a single chirp or ALP, and then run away a few feet, uttering the same soft and not very extreme type of RP described above. Then it would stop, in a silent SC Posture. Then I would have to pat it again, and the whole process would be repeated again & again.



Then I started to poke the bird more energetically. It reacted at first by uttering chirps and ALP's. Then, when I continued poking, it began to utter a few Jills in addition to chirps and ALP's. These Jills usually occurred just when the bird was able to run a few inches away from me, between pokes. Another indication that the Jills are closely related to "RP."

When I frightened the bird by stamping my foot, it ran away, uttering the same type of soft "slow RP" as described above.

✓ Remained quite silent when handled.

Then isolated in box. Immediately starts to utter short, soft, single Peeps, at long intervals. Then starts LC Notes.

Utters PP as greeting when I talk to it.

Then utters chirps & ALP's when I put my hand into the box. These were accompanied by overt escape movements and/or SC.

Then I put it out on the floor. It stood, without running or walking, for some minutes. Performing repeated CK Movements, and 1 Lsh; all quite silent. Twice, it stood in an extreme "Alert Posture" (see next page), for several seconds each time. Also quite silent. I don't know what provoked these Alert Postures — possibly something the bird saw outside the animal house. I cannot be sure that these Alert Postures were ritualized, but they were certainly very extreme, and I have never seen anything quite like them before. Their sudden appearance is somewhat reminiscent of the sudden appearance of CK Movements. No ontogenetic ritualization here either.

Then the bird started to run around the floor, mostly away from me. Uttered typical or fairly typical RP when running. Intermingled with occasional PP Notes, especially when standing still or, at least, not running very fast.



When the bird utters ALP's and assumes an SC Posture when I approach. Then runs away, uttering RP. This RP is more rapid than that uttered by WH earlier, but still not very fast. When I frighten V by stamping my foot, it runs away uttering the same RP, still slightly faster than that of WH.

It will not follow me at all.

When I poke V, it utters many chirps and only a few trills of not very extreme or distinctive trills.

It is beginning to look as if the trill were disappearing, as a distinct, independent, pattern now.



Head becoming "patchy"

Olive scapulars, rufous breast feathers, and rufous secondaries, quite prominent now.

Alert  
Posture

Otherwise, still dark brown stringy-fluffy down.



Ammodramus. cafer, I.July 15, 1960  
Barro Colorado

Little or nothing more in the way of changes in behavior yet. I tried the usual experiments with a couple of the birds today, around 10:15 a.m.

WB. Gave a couple of chirps when handled

Then started RP immediately upon being isolated in a box. Then started RC Notes after a few seconds. Then shut up and started to jump. Once uttered a loud chirp, and performed 1 Lsh Movement, just after it fell back particularly painfully after a jump.

Then I started to talk to it. Its first response was to utter 2 or 3 moderately rapid series of short soft Peeps (about 3 or 4 notes to a series). These appeared to be essentially the same as the "low intensity RP" of WH & V described above on July 12th. They probably were RP — but this seems to be the only form of RP performed by any of the birds now. They seem to have lost the more rapid RP. I shall call this slower form RP2 from now on. The first series of RP2 Notes were each accompanied by several Lsh's, (each Lsh being synchronized with 1 TW, in most cases). One Lsh developed into a complete general shake.

As I continued to utter "Hello"s, the response of the bird diminished in apparent intensity. It just gave 1 Lsh & 1 TW each time I said "Hello" — and sometimes uttered 1 short soft Peep as well (in which case the Peep, Lsh, & TW were all absolutely synchronous).

Then we put the bird out on the floor of the animal house. It stood silently for a minute or so. Did several Lsh's and 1 general shake. Then continued to stand silently, performing many Ck Movements in rapid succession.



When the bird starts to walk around the floor. Uttering PP's, LC Notes, and, occasionally, series of RP2 Notes.

This bird seems to have a slight limp. Not visible when it walks, but unmistakable when it runs.

It will not follow me at all.

Runs away when I approach it. With moderately long Peeps. Probably a form of ALP, but not as loud, and somewhat more plaintive, than usual. Possibly intermediate between typical ALP and typical PP.

Then I tried to approach the bird several more times. It reacted to these approaches in 2 different ways. Sometimes it ran away with RP2. At other times, it went into an SC Posture and remained silent.

WR. Struggles quite silently when handled, even when handled very roughly.

Then put into the box. Stands still at first, uttering repeated ALP's and performing repeated Loli's. Some of the Loli's & ALP's were nicely synchronized, but others were not. Then, after a few minutes, the bird began to utter LC Notes (I couldn't see if they were synchronized with special movements or not).

Then the bird was put on the floor. Immediately runs a few feet away. Uttering PP and RP2 Notes as it runs.

Then stands, performing many Ck Movements, (at least 20), very rapidly one right after the other. Some of these movements were performed while the bird was standing in an ordinary, unneutralized standing posture but others were combined with a typical SC Posture!! Another indication that the SC is an alarm reaction.

Then I tried to approach the bird again & again. Each time it went into an SC Posture when I got a few feet away. Some of these SC's were silent, others were accompanied by ALP's. Most of these



SC Postures were very extreme. The following was perhaps the most common form:




Gray on neck begins  
ing to show in patches.

Wings somewhat raised,  
but not extended

Some of the SC's were even more  
extreme than this. Bill actually almost  
touching ground (i.e. the legs were  
more bent and/or the body was more  
tilted).

This bird would not follow me at all.

Later on, when I tried to approach it again several times, it  
always ran away from me. Uttering ALP's, PP's, RP2, and also some  
notes which I have been calling "Till-like Peeps" (these are the notes  
represented by the  diagram on June 30, p. 117).

When I frightened the bird by stamping my foot, it ran away  
uttering RP2 and Till-like Peeps.

When I poked the bird, it uttered a lot of chirps, and 1 real  
Till. This Till occurred just as the bird managed to escape from me.

So at least one of these birds is still capable of producing a real Till.  
The Tills have become greatly reduced but still exist.

I must add that although all the birds perform a lot of real Ch  
Movements now, they also do a lot of stamping and walking without  
any trace of Ch.



Agelaius cayanus, IJuly 17, 1960  
Barro Colorado

I watched the birds again very briefly this afternoon. Still nothing much in the way of changes.

They still tend to give lots of PP when they are together in their cage. I noticed today that they tend to give particularly loud and somewhat more rapid PP whenever I walk by the cage.

I ran some tests on 2 of the birds.

WH. Utters chirps when running away from me, even before I pick it up. Then remains quite silent when handled, even when struggling violently. Finally utters 1 chirp after being handled for a couple of minutes.

Then I put it in the box. Immediately starts to utter a little PP. Then falls silent. Then does a little more PP. Falls silent again, and assumes an SC Posture, when I look into the box. Then starts uttering P's again, when I go away. These P's are soft and undistinctive, definitely shorter than the PP Notes. Finally, after at least 3 or 4 minutes, the bird begins to utter very soft but otherwise typical LC Notes. Then assumes an SC Posture and utters undistinctive Peeps when I look into the box again.

When I finally put my hand into the box, the bird immediately went down into an LC Posture and uttered many loud ALP's.

Then I put it on the floor. It immediately ran a few feet away from me, silently. Then it stood for a few seconds, performing repeated de Movements. Also silent. Most of the time it stood in an apparently unritualized posture, but every once in a while it would assume a more or less extreme SC for a few seconds, still continuing the CR. It



en it repeated the whole performance once. Then it walked about the floor, in a rather nervous manner, apparently looking for food but still somewhat alarmed. Every once in a while it would run a few feet (not always directly away from me). All this was quite silent. The bird also performed frequent CK Movements whenever it wasn't actually running. Its wings seem to be developing rapidly, and it usually flapped the wings whenever it ran at all rapidly.

I noticed that all or most of the time it wasn't running it kept the wings appreciably drooped. This was also true when it was in the isolation box earlier. This drooping might be an intention movement of flying.

The bird went into an SC Posture, remaining silent, when I approached it. I gave it a tap on the rear. It immediately uttered 1 chirp; and ran a foot away. Then stood, did one D-V TW, which developed into (lateral TW).

Then it uttered chirps, alP's, and very soft but quite rapid trills when jolted.

Then it uttered more chirps when approached again. In SC Posture. Then runs away with RP2. Still in SC when it first starts running. But then gradually relaxes into normal unritualized running posture after it gets about 6 ft away from me.

✓ Utters chirps when handled

Begins to utter typical SC Notes immediately upon being isolated. Then performs silent TW when I talk to it. Followed by 1 chirp; when I continue talking. Then falls silent again. So I left it alone for a while; and then talked to it again. This time it performed silent Sh's + TW as "greeting". Then it started jumping, silently as usual.

Then it uttered chirps, without ritualized postures or movement.



when I put my hand in the box.

Then I put it on the floor. It followed me immediately! — for a few feet. Uttering RP2. Then stopped. Then assumed XC, quite silently when I approached it! I left it alone for a minute or so, and then tried to approach it again. This time it went into SC and uttered ALP's. I tried to approach it twice more. Once it ran away in an SC Posture, uttering RP2. The second time it assumed an XC Posture and uttered ALP Notes.

When poked, it responded by uttering ALP's, and then fell silent when the poking continued. No falls.

Amidex cajanea, I.

July 30, 1960  
Barro Colorado

I came back from my trip to Washington to find the 4 Wood-rails flourishing. Almost completely feathered now — although still much smaller than full grown adults. They were transferred to a medium-sized outdoor cage on July 26th.

We observed their behavior when they were all together in their cage for some time this morning.

As usual, they all uttered lots of PP's when I first came near the cage. Also a lot of slightly harsher notes which appeared to be intermediate between typical PP's and typical ALP's. Slightly harsher than typical PP's — slightly more "urgent sounding." The birds stopped these notes later on when we sat in their cage for a while, when they moved about in the cage and fed in a more or less relaxed "normal" manner. This would indicate that their Peeps when I first approached their cage were a definite reaction to me. Possibly



hostile ??? I think so.

I noticed that most of the time when the birds were not obviously alarmed, just feeding and moving around their cage, they did not perform CK Movements. When they are not performing CK's, their tails are kept more or less horizontal, and their wings are usually held up, resting on the rump. As soon as they begin CK, however, the wings are apparently always drooped a little.

I am now fairly certain that the CK Movements are an indication of alarm, or, at least, mild hostility in which escape is slightly predominant.

While the birds were feeding and moving about their cage, they uttered numerous series of brief soft notes. All or most of these series were quite rapid. They appeared to be either rapid RP2's and/or Fills. The occurrence of such notes, so frequently in such a context, is perhaps rather surprising, as we could not provoke Fills, and provoked very few RP2's, during tests immediately beforehand (see below). This would suggest that the motivation of such Fills or RP Notes at this time is somewhat deficient from the motivation of the Fills and RP Notes uttered by the birds before I went to Washington. (If the Fills and/or RP Notes at the present time are produced by essentially the same motivation as the similar-sounding notes a few weeks ago, then it is possible that they are inhibited by strong escape motivation, and that the birds are too frightened during tests now.)

I am certain, in any case, that all or most of the Fill-like or RP-like Notes uttered by the birds today were not uttered when they were running. When they were either standing still and/or walking about quite slowly.

I think that these notes were uttered both by birds performing CK Movements and by birds not performing such movements, but



I am not sure about this.

While the birds were moving about & feeding, they also uttered quite a lot of typical LC Notes. Usually or always uttered by a bird which had become "separated" from its companions (i.e. was 2 or 3 feet away from its companions). Probably not accompanied by Ck Movements.

At the same time, possibly in much the same circumstances, the birds also uttered some notes which may have been more or less distinctly different, in motivation and/or function, from typical LC Notes. Sounded quite like typical LC Notes, but definitely syllabic. Might be transcribed by something like "Whee - hooooo" —————

It is possible that these notes represent the "beginning" of a new type of call. Jimmy Ambrose first noticed them yesterday.

When I sneezed rather suddenly, all 4 birds ran to a corner of their cage and crouched silently. These crouches did not appear to be ritualized in form.

Later on, when all 4 birds were standing or sitting close together, apparently quite relaxed, they remained absolutely silent.

We ran some tests on all 4 birds immediately before sitting in the cage to observe their behavior all together.

✓ We began by taking V out of its cage, and putting it in another similar cage, by itself. Not in a box. It could see both us and its companions quite clearly. In these circumstances, it uttered a lot of Peeps. Quite long and plaintive. Probably a form of PP, but not quite as long as typical PP Notes.



Then we put the bird in the usual isolation box. First it uttered a few undestructive Peeps, quite soft and short. (I shall call all undestructive Peeps "P"s, tout court, from now on.) Then began to utter typical LC Notes.

I talked to it after it had uttered 6 or 7 of these LC Notes. It did not perform a real greeting. Just uttered more LC Notes, intermingled with P's.

Then it flew out of the box. Stood for a few seconds, performing many CK Movements. Then it started to move around its cage. Performing more CK's. Largely silent during this walking. Only occasionally uttered a few P's, PP's, and very weak & soft LC Notes.

Went into a typical SC Posture when I approached it. Accompanied by a few weak, not very loud, ALP Notes. Then started walking around again when I retreated. Uttering P, PP, and LC Notes as before, with frequent CK Movements. Then down into SC with ALP Notes when I approach again.

I then picked it up and handled it quite roughly. It remained absolutely silent throughout this handling.

Then I put it down on the ground and chased it a little. It uttered PP's, ALP's, and one brief burst of typical C.C. (relatively slow) RP2, during this chasing. Then I let it rest a minute, and then approached it again. It went down into SC and uttered ALP's as usual.

These ALP's, and many of the ALP's it uttered earlier today, were not very different, in sound, from PP's. I was again impressed by the fact that the series P-PP-ALP-chirp appears to be almost a continuum, at the present time.

Then it uttered ALP's and some RP2 when picked.



WH Uttered loud chirps when being caught, and then when handled.

It was put straight into the isolation box; and immediately began to utter soft SC Notes.

Then, when I put my hand into the box, it went into an extreme SC Posture (legs flexed, but the bird was not actually sitting down) and uttered loud harsh notes (these notes appeared to be exactly intermediate between typical ALP's and typical chirps). Then it uttered typical chirps when I caught it again.

It performed several silent Lsh's immediately after being put on the ground. No CK Movements. When it started to walk around still silent, and still no CK Movements.

Then I chased it for a while. It uttered ALP's, and/or notes intermediate between typical ALP's and typical chirps (this bird seemed to be very prone to utter such intermediate-sounding notes) when running away. Probably also 1 or 2 bursts of very soft but otherwise typical RP2. Then I let it rest for a few seconds. When I approached it again, it went down into SC, and uttered chirps and/or notes intermediate between typical chirps and typical ALP's. Then it uttered chirps, and notes intermediate between chirps and ALP's, and some RP2, when poked.

WB Uttered typical chirps when handled.

At first remained quite silent when isolated in the box, but eventually, after several minutes, it uttered a few typical SC Notes. Then it began silent jumping.

Then we put it on the ground. Immediately went into SC. Quite silent, but accompanied by TW. Then it ran away from us, perf



making Ck Movements. Still silent. Then it began to feed. Still performing Ck Movements from time to time. Remained quite silent throughout.

Then uttered a few weak ALP's and a little RP2 when checked. Remained almost completely silent, only uttering 2 or 3 weak ALP Notes, when probed.

WR Give typical chirps when handled.

Uttered 1 LC Note when isolated in box, and then immediately jumped out.

Then walked around the cage, feeding, performing lots of Ck Movements. Silent throughout. (The birds certainly do not usually utter anything, when they are by themselves, during the tests, as long as they are not actively molested. Probably because they are just slightly alarmed by our presence in such circumstances.)

Then WR uttered a few notes intermediate between typical ALP's and typical chirps (quite like the notes uttered so frequently by WB) when checked. Possibly the ALP's and chirps are really beginning to "merge" with one another now.

Then WR remained quite silent when I probed it repeatedly.

As a general conclusion, as a result of these tests, I can say that the RP2 has become relatively rare, and Trills seem to have completely disappeared, in such circumstances (see above).

None of the birds made the slightest attempt to follow me at any time during these tests.

Our captive pair of adult Wood Rails laid another clutch of 4 eggs shortly after we took their young away. Yesterday, Ambrose found that one of the eggs had been kicked out of the nest and broken.



The other 3 eggs were already pipped. So he collected them all and brought them in to the lab and put them under the light. The first egg (WH2) hatched around 9:15 a.m. The second egg (WB2) was hatched prematurely (by me) around 1:30 p.m. I shall mark all the notes on the behavior of the birds in this second clutch by ~~XXXXXX~~

All 3 birds have uttered notes in the egg, long before hatching (in the case of the third egg, I know that the bird uttered notes at least 24 hrs before hatching). All the notes uttered before hatching seem to be Peeps, or something very similar. The great majority seem to be undistinctive Peeps. Single notes, quite loud and clear, without any peculiar features. A few notes seem to be harsher & hoarser, intermediate between typical P's and typical chirps. (It is quite possible that further investigation will show that these harsher notes are, in fact, "real" chirps.) These harsher notes are also always single.

The birds in the egg do not utter notes frequently (less frequently than hatching gull chicks, I think). They will be silent for minutes or even, then utter 1 note; then fall silent for several more minutes; then utter a second note; etc etc.

It is quite probable that all the notes uttered by chicks in the egg are distress notes. Once for instance, we got the temperature of the incubation box too high, and the chick in the third egg began to utter a whole series of Peeps one right after the other. This is the only time we have heard P's uttered so rapidly. They were all of the undistinctive P type. The bird became silent as soon as we lowered the temperature.

Similarly, when I hatched the second bird artificially and prematurely, it uttered a whole series of loud P's, one right after the other, as I pulled & poked at the egg shell & membranes.



I did not pay much attention to the behavior of WB2 immediately after hatching, but I did observe the behavior of WH2 after hatching in considerable detail.

It continued to utter notes as before hatching for about an hour after it got out of the egg, (until it was beginning to dry out appreciably). Still largely undifferentiated P's, with an occasional chirp-like P. The undifferentiated P's might be transcribed by something like "Wheoo" or "Wheep". Apparently still purely generalized distress reactions. A single "Wheoo" sometimes uttered when the bird seemed to be uncomfortable in the incubation box. P's became more frequent when the chick was handled. When the chick was handled roughly, and uttered several P's one right after the other, the P's were usually "Wheep"s, not "Wheoo"s. This would suggest that the "Wheep"s were either higher intensity and/or more hostile than the "Wheoo"s.

Once, when I handled the chick about a half hour after hatching, it uttered a "cheep cheep cheep". These notes were quite chirp-like.

The series "Wheoo - Wheep - cheep" may be a continuum at this stage.

By the time the bird was becoming noticeably drier, about an hour after hatching, some of the P Notes it uttered when undisturbed in the box were becoming noticeably longer & more plaintive. So much so that they seemed to be real LC Notes (even longer than P's). At first they were quite soft, but they rapidly became louder. By 11:30 a.m. this WH2 bird was uttering quite typical, relatively loud, LC Notes.

After lunch, we took WH2 out of the incubation box, and put it into a larger box. It immediately began to move around, on its turn. This was accompanied by a lot of LC Notes, and also a lot of single chirp.



• Ammodramus cajama, July 30, 1960, IX,

(47)

like Peeps or weak-sounding chirps. This would indicate that the chirps or chirp-like notes are still distress reactions.

None of the notes was accompanied by ritualized postures or movements. All of them were uttered with the bill closed.

We did notice one very interesting movement, however. By WH 2, almost immediately (within a half hour) after hatching, while it was still very wet. At this stage, its little coccyx was quite conspicuous, and was repeatedly flicked upward. This may be the first form of CK. I couldn't determine the stimuli releasing these movements, or their function(s), if any; but the chick was trying to move around a little, probably trying to get more comfortable. (If the CK pattern is really present from the time of hatching, I may have overlooked it in the young chicks of the first clutch because the coccyx is obscured by down as soon as the down is dry, until real feathers appear.)

When the WH 2 chick first tried to lift its head after hatching, the head usually trembled (laterally) to a quite appreciable extent. This seemed to be essentially the same as the lateral quivering which used to be performed by the chicks of the first clutch struggling in my hand. Probably just an indication of intense muscular effort.

Ammodramus cajama, I

July 31, 1960  
Barro Colorado

The first chick hatched, WH 2, seems to be flourishing this morning; but the premature one, WB 2, seems to have rickets or something — can't keep its legs from sprawling sideways.

The third egg hatched (normally) this morning at 7:25 a.m. I



✓ shall call this third chick "WR2".

WR2 was uttering perfectly distinct "Wheoo"s and "Wheep"s, like those of WH2, by 7:35 a.m., 10 minutes after hatching.

At 7:35, I also tried handling WH2 a little roughly. It just uttered "Wheep"s and LC Notes. Another indication that the LC Notes may be a generalized distress reaction at this stage. (It is possible that WH2 uttered LC Notes when handled because it was separated from its companion, WB2; but older chicks certainly do not utter LC Notes when handled.) Finally, it uttered a single chirp, after the handling had continued for several minutes.

Immediately afterwards, I put WH2 back on the floor of its box and started to poke it. It responded by uttering many loud, apparently high intensity, chirps.

Around 7:40 a.m., I noticed that WH2 Notes have a definite quavering or trilling quality now. This is probably not because they are particularly closely related to "real" Trills. WH2 was uttering these quavering LC Notes in its box, when it was more or less separated from WB2.

Surprisingly enough, the chirps, P's, and LC Notes of WH2 seem to be quite well segregated at the present time. It has little or nothing like the "intermediate" PP and ALP patterns of older chicks.

At 1:05 p.m., I tried poking both WR2 and WH2. Both reacted in the same way. Crouched flat on ground, head down & resting on the ground, and uttered loud chirps.

I tried poking WH2 again at 9:00 p.m. this evening. It reacted much less vigorously. Just squatted down, without lowering its head very much, and uttered "Wheep" type P's.



Ammodramus cafer, I.August 2, 1960  
Barro Colorado

One thing I noticed yesterday morning was that the new chicks were usually silent when all together in their cage. Only once in a while would one or more of the chicks (usually WH2, I think) utter a few soft Peeps. There appeared to be low-intensity undifferentiated P's, still not prolonged or plaintive like well-developed PP's.

Yesterday evening, after supper, around 7:30 p.m., one or more of the chicks was uttering more P's, when just sitting quietly or moving normally around the cage. But such P's were still by no means very frequent. The chicks were still more often silent than not. I think that some of the P's uttered last night may have been slightly longer than in the morning. They were all still very soft. I think that the longer P's last night may well have been the beginning of PP patterns.

By 6:30 a.m. this morning, the chicks were uttering quite a lot of Peeps in their cage. All these Peeps were still very soft. Some of them were still short, still undifferentiated P's. But quite a large proportion were relatively long, and some were quite plaintive in quality. In other words, the PP patterns were becoming quite distinct by this morning.

I ran some simple tests on a couple of the birds around 6:35 a.m. this morning.

WH2 I put the bird on the floor, and then dragged my hand slowly away. The bird followed my hand very well. It uttered P's and PP's during this following. Most of the time it followed by walking, but every once in a while it would run a few inches. When it actually ran, it tended to utter series of P Notes quite rapidly — — — — This may



well represent the beginning of RP, but none of the series uttered by WH2 this morning were as rapid, or as long-sustained, as the well developed RP1 of the chicks of the old clutch.

WH2 also uttered P's and chirps when poked. Still no Hlls.

WR2 Was put on the floor like WH2, and tested in the same way. It followed me quite well at times, but also ran away from me at other times. (This being the third chick to hatch, it is not as well fixated on me as WH2. It is partly fixated on its companions instead.) WR2 uttered P's both when following and when running away from me. In both cases, the P's were sometimes uttered in accelerated series. Some of these series were more rapid and longer than anything uttered by WH2. The most rapid series uttered by WR2 were uttered when it was running away from me. Because it was more distressed when running away? Or more hostile ???

Like WH2, WR2 uttered P's and chirps when poked. No Hlls.

Neither bird made any real attempt to run away when poked. This might help to explain why they did not utter Hlls in such circumstances (if the Hll & RP patterns are really closely related).

All 3 chicks seem to be doing well - although WB2 still has its "melts".

Ammodramus caryacus, I.

August 3, 1960  
Barro Colorado

Two of the new chicks, WH2 and WR2, seem to be flourishing. (But we decided to dispose of WB2).



Arumides cajana, Aug. 3, 1960, I. (51)

I ran a very few tests on the two new chicks this afternoon, around 5:30 p.m.

WH2 Uttered moderately rapid series of short P's when following me. (Three times.) Then uttered very short P's and chirp-like P's when poked.

WR2 Uttered the same type of P's as WH2 when following me. Then uttered accelerated "bubbling" bursts of short P's when poked. Each burst contained 4 or 5 individual P Notes. These bursts were really quite reminiscent of Jills.

It is interesting that WR2's behavior seems to be developing much more rapidly than that of WH2.

Arumides cajana, I.

August 8, 1960  
Barro Colorado

I decided to take a look at the first brood, and run some tests, beginning at 7:00 a.m. this morning.

All 4 birds seem to be doing well. Completely feathered, and legs already starting to turn pink, but still much smaller than adults.

When I first approached the cage, the 4 birds became quite vocal — as usual — but the notes they uttered were rather different from the ones they used to utter earlier in similar circumstances. This morning they uttered lots of P's, and a few AlP's, but few or no PP's!

The tests went as follows:

V.

Went into a silent SC Posture when first approached. Remained silent when handled, at first. When the handling continued for several minutes, however, the bird uttered 2 LC Notes, followed by 1 or 2 PP's, and



then one double note, like the notes described above on July 30, 1960, p. 41. This double note this morning might be transcribed as "Wheee-heeeeee" or, perhaps, "Whee-ee Heeeeee". (I shall call such notes "DN" from now on.)

• When the bird was put down on the ground and I chased it. It ran away, uttering RP2 as it did so!

Then the bird was put in the usual isolation box. It uttered a few P Notes, and then immediately flew up and perched on the upper rim of the box. It stood there for several seconds, uttering RP2 — in fast "bubbling" bursts, almost like Trills.

Then it uttered chirps and ALP's when I stretched out my hand toward it.

• Finally it flew down to the ground, and I poked it a little. It uttered chirps and ALP's when poked.

Then the bird was left alone in the cage for some minutes. It walked around, feeding, in a not particularly excited manner. Occasionally uttered a soft P; but most of the time it was silent. Occasional, but not very frequent OK Movements. Then the bird paced back & forth along the side of the cage nearest the cage of the other 3 birds (which it could see quite clearly); but it remained quite silent.

When we approached the bird again, it went down into a silent SC, and then a silent XC. After a few seconds, it stood up again, uttering a Trill-like burst of RP. Then, a few seconds later, it suddenly uttered several soft LC Notes.

WH.

Went into silent SC when first approached. Uttered lots of loud chirps immediately, as soon as it was picked up and handled.

Put into separate cage by itself. Starts to walk around & feed.



Quite silent. Without Ch. Movements at first. Then performed a whole series of Ch. Movements, one right after the other, still silent.

Then I chased it a little. It uttered rapid RP and a few chirps as it ran away.

Then put into isolation box. Began to utter soft LC Notes immediately.

Then uttered chirps & bursts of RP when I put my hand into the box; both types of notes being uttered while the bird was in an extreme SC Posture.

I withdrew my hand, and the bird started to utter loud LC Notes.

When we put the bird on the ground, and I poked it. It responded by uttering chirps and real, extreme, Tills !!!

WB

Went into silent SC when first approached. Then uttered several chirps, and 1 perfectly typical LC Note when handled !!

Put into cage by itself. Walks around, performing lots of Ch. Movements. Quite silent.

When approached, it ran away, uttering first ALP's and then chirps.

Then put in isolation box. Remains silent, and flies out within 5 seconds.

Then I chased it on the ground for quite a while. Ran away, uttering occasional chirps, but no RP or Tills. Then uttered chirps when poked. Again no RP or Till.

WR

Runs away, silently, when first approached.

Remains silent at first when handled, but eventually utters



Ammodramus cafer, Aug. 5, 1960, IV

(54)

3 or 4 P's (quite undistinguished, but of moderate length).

Put in isolation box, but flies out immediately.

Runs away when chased. Usually silent, but occasionally utters a single chirp. Almost all the time, during this running away, the bird kept its wings drooped, and its tail raised (in the position from which Ck Movements are made), although it did not, in actual fact, perform any Ck Movements. I shall call this the "pre-Ck Position". When the bird uttered chirps, in a pre-Ck Position, without actual Ck Movements, when poked.

It is fairly obvious, from the behavior of the birds today, that their potential repertoire of calls has not changed at all in the last few weeks. They are still capable of uttering Trills (and LC Notes when handled). Why haven't they been uttering all these calls all along then? Perhaps because they have been becoming wilder. This morning, they had not been fed yet when we ran the tests. Presumably hungry. So perhaps they "reverted" to more "filial" behavior. In this connection, it may be significant that V and WH were obviously tamer, throughout the whole period of testing today, than WB and WR.

Ammodramus cafer, I

August 6, 1960  
Barro Colorado

Both WH2 and WR2 seem to be flourishing now.

I noted, this afternoon, that they uttered lots of brief P's, and bursts of short notes, apparently including both RP and Trills, whenever I came near their cage — but little or nothing else.



Maurides cajanea, I.August 7, 1960  
Barro Colorado

WR2 seems to be flowering, but WH2 developed a lump this afternoon. I don't know why.

Running tests on WR2. Utters chirps when handled. LC Notes when isolated. Runs away silently when chased. Then stands silently, performing definite Ck Movements. Utters P's & chirps when poked, plus one brief burst of P Notes which may have been a Fill.

Will not follow at all !!

Maurides cajanea, I.August 8, 1960  
Barro Colorado

WH2's lump seems to have disappeared today; so we ran some tests on both animals this evening, around 6:30 p.m.

WH2

Did not crouch when first approached. Remained quite silent when handled. Uttered LC Notes immediately when put in isolation box. Did not crouch when I put my hand in the box, but continued to utter LC Notes undisturbed.

Then we put it on the floor. Runs away. Largely silent, occasionally uttering a single LC Note. After a while, it finally began to utter P Notes which may have been a form of RP. Not fast.

Finally we managed to get it to follow us. Again uttering a form of RP, apparently low intensity. Not fast. Notes frequently arranged in triplets.

Then I tried to poke the bird. It ran away very rapidly, uttering



Araucides cajana, Aug. 8, 1960, II.

(56)

Long bursts of many short notes. Either RP and/or Tills.

WR2

No crouch when first approached. Uttered a few chirps when handled. Began to utter LC Notes immediately when put in isolation box. Then starts silent jumping. No crouch when I put my hand in the box. Then we put the chick on the floor. Would not follow us. Just stood and walked around, uttering occasional P's and LC Notes. Then utters chirps & P's when picked.

Araucides cajana, I.

August 14, 1960  
Barro Colorado

This afternoon, when I went near the cage of the of the new chicks, they uttered series of fast, rapid, notes, RP's and/or Tills.

This evening, when I first went near their cage, they uttered a few longer notes. RP's and/or LC Notes.

I was struck by the thought that some of the notes uttered by the first-clutch chicks which I called RP's may have been closely related to ALP's.

Later this evening, when I approached the cage again, both chicks uttered P's (moderately long notes). One of them also uttered LC Notes. The other also uttered chirps (these chirps were not very harsh, but they were fairly distinct from ALP's).

Then I ran the usual series of tests on both birds.

WH2 Uttered RP when approached. No crouch.

Then uttered LC's immediately upon being isolated. Continued to utter LC Notes, without change, when I spoke to it.

I put my hand into the isolation box. The bird did not res



pond very conspicuously; but it did lower its head, a little, in what may have been an indication of a crouch posture.

When the chick was put on the ground. Ran away immediately. Quite silent when running. Then stood, uttering LC Notes. Then stopped uttering LC's. Stood silently, performing Ck Movements.

Then it ran away again. This time it uttered RP's while running. Then uttered chirps when I stepped on it accidentally. Then it ran away again, uttering more RP. Then stood, uttering LC Notes.

Ran away with more RP when poked. Then utters chirps when poked more vigorously. Then utters more RP and chirps when poked again.

(NOTE. This bird was very shy. Ran away whenever I looked at it.)

WR2 Uttered RP when approached. No crouch.

Then uttered chirps when handled.

Then uttered LC Notes immediately upon being isolated.

I put my hand down into the isolation box after the bird had been uttering LC Notes for a minute or so. It responded to my hand by lowering its head, on its shoulders, very briefly. But the head was not kept lowered. Raised again almost immediately. Then lowered again. Raised again. Etc. Etc. Repeated up and down movements. All accompanied by P's and RP's.

Then the bird started silent jumping.

When the bird was put on the ground. It immediately lowered its head and its neck in what was obviously a low intensity, preliminary indication of a real SC. Then ran away silently. Then stopped and stood in pre-Ck Position; then performed Ck Movements; all quite silently. Then the bird walked away, uttering LC Notes.



When the bird ran away, silently, when I started to approach it. When I got closer, it started to utter definite ALP's, and went into a definite but apparently low intensity, possibly still unritualized or only slightly ritualized, SC. Commence SC.



Rufous wing feathers just beginning to show.

Legs probably just slightly flexed, at least at first.

Then utters chirps & RP when probed. Then runs away with more chirps & RP.

Then walks around the floor, more or less undisturbed, when I leave it alone. I noticed, however, that it tended to flex its legs a little, and crouch down a little, in an apparently unritualized posture, whenever it was frightened by some loud sound or unexpected movement in its environment.

All this would suggest that the SC may be developing by a process of ontogenetic ritualization at this stage.



Ammodramus cajauea, I.August 20, 1960  
Barro Colorado

Unfortunately both chicks of the new clutch seem to have developed rickets or something similar this last week. WR2 had it very badly. Both a little better now.

I went up to see the chicks around 11:30 tonight. They both greeted my appearance with lots of rapid notes. Including RP and real, loud fills!

Both of them lowered their heads a little when I put my hand in the wire cage, but did not do anything more in the way of crouching.

I did not test them further, for fear of hurting their legs.

Ammodramus cajauea, IAugust 23, 1960  
Barro Colorado

Experimented a little with the chicks of the first clutch this morning from 7:30 a.m. onward.

They all seem to be flourishing. Their legs & bills are so light now that they are almost the colors of the legs and bills of adults.

When I first appeared near their cage, the chicks uttered RP and/or fills, and ALP's. Now ALP's were combined with SC and (once or twice) XC. The chicks are obviously getting shyer and shyer now.

The experiments went as follows:

✓

No crouch when approached.

Uttered quite a lot of chirps when handled. These chirps were much harsher - more urgent sounding - than before. They were still un-



mistakably chirps, but beginning to sound like the "Squawk"s of adults. The bird uttered a whole series of these chirps while held in the hand. Then gradually declined or changed into "Cluck"s, quite like the "Cluck"s of adults.

• Then the bird was let loose in a cage by itself. Ran around quite silently. Then it was put in the isolation box. It stayed in the box for at least  $\frac{1}{2}$  a minute, but remained quite silent. Then flew out silently.

Then I drove it into a corner, where it ran madly back & forth, obviously trying to escape. Uttered Squawk-like chirps when I put my hand down near it. Then uttered more Squawk-like chirps, accompanied by more escape movements, when probed. Again

WH

• No crouch when approached.

No sound when handled.

Let loose in cage by itself. Ran around quite silently. Then I started to approach it, and ran away from me again & again. Each time uttered B's, alP's, & Squawk-like chirps. Also uttered some RP and Trills (and some sounds which appeared to be almost exactly intermediate between Trills and alP's - i.e. Trills with the "urgent" tonal quality of alP's).

Then put in isolation box. Stayed in for a minute or so. Quite silent throughout. Then flew out silently.

WB

No crouch when approached.

Uttered chirps (not nearly as Squawk-like as those of the other birds) when handled.

Then let loose in cage by itself. Walked back & forth, in corner, uttering quite adult-sounding Clucks!

(It is fairly obvious that these Clucks are lower intensity than chirps)



ps - both "infantile" chirps and Squawk-like chirps - now.)

Then the bird was put in the isolation box. Stayed in for a couple of minutes. Quite silent throughout. Then flew out silently.

Then gave chirps, accompanied by escape movements, when poked. I finally left it alone and walked away. It continued to run back and forth along the side of the cage, obviously trying to escape, but uttered clucks instead of chirps. Occasionally performed a few CK movements.

The transition between chirps and clucks during this last incident. This would suggest that the clucks of this bird (probably unlike those of V - see above) are already well segregated from chirps.

WR.

Runs away, uttering clucks, when approached.

Silent when handled.

Then let loose in cage by itself. Uttered 1 loud Squawk-like chirp when poked, then ran away. Again, uttered Squawk-like chirps and ran away when I approached it. Then switched abruptly to clucks when I stopped approaching, but continued escape movements as before. After a few seconds, it fell silent, still continuing escape movements with undiminished vigor!

These clucks can now be distinguished from one another by the following characteristics:

WH = black tail + no occlusion

WB = lightest band on tail - band most nearly terminal

WR = darker band on tail - band less nearly terminal

V = dark tail with concealed gray band at base



Maunides cajanea, I.

August 30, 1960  
Barro Colorado

Watched the birds of the first clutch this afternoon.

• They all gave ALP's and P's when I first approached their cage. One bird then went down into XC, and uttered a few "muffled" Squawks or Squawk-like chirps as it did so. The birds then relaxed a little, after about 2 minutes, and started to run around, uttering P's.

Then I walked away, and approached the cage again about 5 minutes later. All the birds uttered ALP's and P's again as I approached. One bird then ran away, in typical running posture, neck stretched forward and low, uttering Squawk-like chirps.

• (In case I have forgotten to mention it before — this typical running posture, with neck stretched forward and low, is assumed by young chicks as soon as they are able to run properly.)

It seems obvious that the relationship between the ALP's and Squawk-like chirps of these birds now is essentially the same as the relationship between their ALP's and "juvenile" chirps when they were younger.

The birds calmed down very rapidly this time. As soon as they were calm, they fell completely silent, and remained silent.

Then I tried some experiments with WH. It was put in a cage by itself at 4:08 p.m. Just walked about, feeding from time to time. Quite silent, until I finally stopped the experiment at 4:30 p.m. for the LC pattern does seem to have definitely disappeared.

When I went to pick up WH, it ran away quite silently. Also silent when handled.

⚡ I finally had to destroy WR2 tonight, as its legs were worse. WH2 seems all right, although some of its toes are permanently crooked.



*Ammodramus cafer*, I.September 7, 1960  
Barro Colorado

My pair of breeding birds just hatched a new clutch today! Three chicks. When I first saw them this afternoon, they were all 3 still in the nest 2 quite dry; 1 still slightly wet. I will mark my notes on this third clutch ~~XXXXXX~~ I am leaving these chicks with the parents.

*Ammodramus cafer*, I.September 10, 1960  
Barro Colorado

WH2 has now been transferred to an outside cage, not far from the cage of the first-clutch birds.

When I first approach the cages this morning, WH2 runs away, in SC Posture, uttering perfectly typical AP's. Then stands still, uttering LC Notes.

When I approach the cage of the first-clutch birds, they all utter notes which are quite different, in sound, from any I have heard before. Moderately short, plaintive, melodious "Ooo" or "Oah" Notes. Without any new specialized postures or movements (2 birds just form the movements while uttering these notes, but the others do not) I shall call these notes "OO".

It seems probable that the OO Notes are local descendants of the old P's.

Although the voices of these birds would appear to have changed very greatly in the last 2 or 3 weeks, this change seems to have been of a rather peculiar kind. Their voices seem to have "broken", i.e. changed in tone. This means that their vocal repertoire sounds very different,



but the actual repertory itself is probably not very different!!

As soon as the birds get used to my presence, they fall silent and remain that way. Start to feed quite peacefully.

The birds start uttering OO Notes again as soon as I start moving around. Then, when I go into their cage, they continue to utter OO Notes while running around noddly, trying to escape from me.

I finally catch one of the birds. At the moment of capture, it utters a lot of Chucks and 1 Squawk-like Chirp (this might even be called a pure Squawk - tout court - now). After being held a while, the bird subsides a little and utters only Chucks (not quite as rapidly as before).

I then put this bird alone in the isolation cage. It runs about quite silently, usually in the pre-CK Posture, occasionally performing CK Movements, as long as I just stand still and watch it. Then, when I start to move around, it starts to run more vigorously and utters a few OO Notes (still in the pre-CK Posture, performing CK Movements quite frequently).

It is obvious that the CK patterns are either lower intensity and/or contain a weaker escape component than the OO Notes.

This bird remains silent for 15 minutes after I leave it alone in the isolation cage. Then I have to chase it a long time in order to catch it. When first chased, it utters a few OO Notes while running. Then runs silently for a while. Then utters one Squawk-like Chirp when the chase is at its peak of vigor. Then runs silently again. Finally when caught and handled, the bird remains quite silent.

So the complete vocal repertory of the birds now would seem to be OO Notes + Chucks + Squawk-like Chirps (or Squawks).



Acridotheres tristis, I.

September 17, 1960  
Barro Colorado

When I approached WH2's cage this afternoon, ca. 5:00 p.m., it uttered a few P's, and then ran away silently. Then it stood and uttered LC Notes, at first very soft, then becoming louder.

Then I chased it a long time, trying to catch it. It ran away very rapidly, continuing to run a long time without any attempt to crow. Most of this escape running was quite silent, but once the bird uttered 3 or 4 very soft Clucks. When I finally caught the bird, it uttered a lot of chirps. These chirps were loud and shrill, but not squeak-like. After the bird had been held firmly for some time, it stopped uttering chirps and began to utter Clucks. The transition was absolutely abrupt! (This would suggest that the Clucks do not develop by gradual segregation from the chirps.) The first Clucks were remarkably soft — so much so that I thought that they were nothing more than the pounding of the bird's heart — but they gradually became louder, until they were almost or completely as loud as the Clucks uttered by the birds of the first clutch. It was noticeable that the Clucks started, and the chirps stopped, at the moment when the bird stopped struggling violently in my hand. It continued to utter Clucks as long as it remained more or less passive in my hands. After a minute or so, it began to struggle violently again, for a second or so. It stopped uttering Clucks, and began to utter chirps again, as soon as it started to struggle again. Then it stopped chirps and began to utter Clucks again when it stopped struggling and became passive again. This alternation of struggling + chirps with passivity + Clucks was repeated several times.

All the chirps were accompanied by opening and closing of the



Arumides cajanea, Sept. 17, 1960, II.

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Cull, with each note. All the Chucks were uttered with the bill closed. But each Chuck was accompanied by a conspicuous swelling of the feathered chin region. (the swelling subsiding between notes).

WH2 is almost or completely full grown now. Its legs are quite pinkish (although still dull), but its bill is still almost completely blackish. (2 of its toes are slightly deformed, but this doesn't seem to impede its running or walking ability.)

Arumides cajanea, I.

September 18, 1960  
Barro Colorado

When I approached the cage of the first brood this afternoon, they all responded by uttering OO Notes. Both with and without SC's. All these OO Notes were bisyllabic "Oo-aah"s. One or more of the birds also uttered some more urgent-sounding notes. These sounded very much like the ALP's of younger birds — although I suppose they should be classified as modified Squawks now.

I have been leaving the chicks of the third brood strictly alone with their parents. One of them disappeared the day after hatching, but the other two seem to be flourishing.

The only display of these chicks I have noted is LC Notes. They utter LC Notes when separated from the parents, and some of these LC Notes are quite remarkably loud and penetrating!

Arumides cajanea, I.

September 17, 1960  
Barro Colorado

Did a little work with the birds of the first brood this afternoon.



beginning around 3:15 p.m.

When Ortega and I first approached the cage the birds uttered OO Notes, with and without S, in the usual way. One of them (at least) also performed Lk's and Pr. movements, probably silent (but possibly with the OO Notes).

When we caught all the birds, one right after the other I am not sure that I can identify them all correctly now, so I will just call them by numbers.

### I.

When we went into the cage to get this bird (and the others later on) all the birds ran away silently. No OO Notes.

Silent when chased. Silent when caught. Silent in the havel, at first, as it lay passively. Then uttered 2 single Clucks as it struggled a little. Then fell silent as it became passive again. Then uttered a single Cluck as it struggled a little again. Then fell silent as it became passive again. Etc. Etc. Etc.

Then we put the bird in the isolation cage. It ran away silently. Then started to walk about in the usual pre-Clk Posture, performing occasional Clk Movements. Silent throughout.

Silent when chased again.

Then driven into an adjoining cage, in which there is a half-grown Greater Zinamon. I paid absolutely no attention to the Zinamon. Just ran about in pre-Clk Posture, performing occasional Clk Movements. Occasionally assumed an extreme alert posture (with tail still cocked in the pre-Clk position). Silent throughout.

### II

Silent when chased. Silent when caught. Then began to utter soft Clucks when lying passively in the havel. Then uttered Squawks as it str



uggles briefly. Then uttered soft Chucks again as it became passive again.

Put in cage with I and Juamou. Ran away from us silently. No pre-Ch Posture or Ch Movements. Then I ran over to join it. No G.C. by either bird. Then both birds started to walk around, more or less together, both in pre-Ch Posture, both performing occasional Ch Movements.

### III.

Ran away silently. Silent when caught. Silent when struggling in the hand. Then began to utter moderately loud Chucks when lying passive. Then fell silent again when struggling again. (Whether struggling is accompanied by squawks or is completely silent presumably depends upon the relative strength of the attack and escape drives.)

Then the bird began to utter rapid soft Chucks when passive. Then uttered brief squawks when probed (while still being held in the hand).

Then put in the Juamou cage with I and II. III immediately ran toward the other two birds. No G.C. No pre-Ch Posture or Ch Movements. Then III stood for a while, with bill open in a "G". Presumably panting. Then performed a General Ruffle. Then stood in an alert posture (without "G"). Then started to walk about at a moderate pace. Performing Ch Movements — without a typical pre-Ch Posture! Wings meeting above tail, as in the ordinary "relaxed" walking posture, even when the bird was performing extreme Ch Movements.

### IV.

Then we went over to the cage where IV remained, by itself, without actually entering the cage. IV uttered a few OO Notes and then ran away silently.

Then it started to walk rapidly back and forth, along the side of its cage nearest the Juamou cage where I, II, and III were. In pre-



Arumides cajamae, Sept. 19, 1960, III.

(9)

Ch Posture, performing frequent Ch Movements

During this performance, it occasionally uttered single, soft, particularly plaintive OO Notes. Sometimes ??? I doubt it. Probably reaction to me.

After a while, IV appeared to relax. Started to feed and preen, apparently normally. We left it alone for 12-15 minutes, and it remained silent throughout the whole period.

After this we put all the birds back together in their old cage.

Arumides cajamae, I

September 21, 1960

Barro Colorado

Began observation of the birds around 1:15 p.m.

WH2 was already in isolation cage when I appeared (it had been transferred because the boys were fixing its usual cage - it may have been upset by the whole procedure). It was silent when I approached. Then ran away, silently, in pre-Ch Posture with occasional Ch Movements. Then continues to run about silently, without Ch patterns. Then utters chirps when caught. Continues chirps while struggling in hand. Then put in Juamou cage. Runs away silently. Ignores Juamou.

Then we did a little experimenting with the 2 chicks of the third brood. They are still in the same cage with their parents.

Both birds ran away, uttering faint loud ALP's when we went into their cage and chased them. When we finally caught one, it continued to utter ALP's steadily. Both when struggling and when passive. Perhaps becoming a little louder and shriller when struggling was most intense (but they were certainly loud and shrill at all times). Gradually, as the bird continued to be held in the hand, it stopped struggling very much and remained more or less passive all the time. At the same time, its ALP's gradually declined into



P's — and then the bird gradually fell silent.

We then took it into my house and let it run loose on the floor. It ran away immediately — silently. It went straight to a dark corner and crouched there, silent and motionless. This crouch did not appear to be ritualized in form (the head was not lowered as in XC). The bird remained quite silent and motionless when picked. Then ran away silently again. Crouched silently again. Ran away silently again. Crouched. Ran. Crouched. Ran. Again and again. Always the same.

Then I picked it up again very gently. This time it remained largely or (more probably) completely silent both when struggling and passive. (I did hear very faint "clicking" noises during some of these struggles. I think that these sounds were made by its toenails as it kicked.)

Then, when I started to handle it a little more roughly again, it began to utter ALP's again.

Then we let it back into its cage. It immediately ran over to join its parents and siblings. No greetings by anyone.

Ammodramus cafer, I.

September 24, 1960  
Barro Colorado

The young birds of the 3rd clutch were still uttering LC Notes, loud and clear, this morning.

This afternoon we did a little experimenting with the birds around 2:30 p.m.

We started with the birds of the 3rd clutch. When we went into their cage to catch them, they ran away silently. When we finally caught one bird, it uttered ALP's and/or chirps (probably both + intermediates). Then immediately fell silent and remained motionless passive in the hand (this was quite



different from the behavior of the young bird caught on Sept. 21). Then it started to utter ALP's and/or chirps as it started to struggle again. Then silent again as it became passive again. Then ALP-chirps as it started to struggle again. Then silent again as it became passive again. No Clucks at any time

Then we let the bird run around the floor of my house. It ran and rumbled (unentrained) in a dark corner just like the bird on Sept 17. Repeatedly. Silent all the while.

When we put it back in its cage, it immediately rushed over to its sibling. No greeting by either bird.

Then we went down to the cage of WH2. Silent when we approached. Then ran away silently. I presume that WH2 remains silent in such circumstances because it is less tame than the chicks of the first clutch).

Then we caught it. It uttered very shrill loud chirps (still not squawks) at the moment of being caught, as it struggled. Then went passive almost immediately and began to utter rapid clucks — — — — —

Bill open during clucks (panting?). Accompanied by the usual throat movements.

Then we went over to the cage of the birds of the first clutch. One bird uttered OO notes in SC, as "greeting". The other 3 just ran away silently. Getting shyer?

Ammodramus caajanae, I.

September 27, 1960

Barro Colorado

Did some more experimenting with clucks, around 2:00 p.m.

Began with WH2. Silent when first approached. Silent when chased.

Silent when first caught. Then starts clucks when passive in hand, after being held for some time.



Then we put WH2 in another cage, the cage of the 4 birds of the first clutch. They immediately began to chase it. No display movements or postures by any of the birds. WH2 just ran away from the others in the usual running posture. Whenever one of the other birds caught up with WH2, it just tried to peck WH2. Pecks usually directed to WH2's head.

As soon as WH2 was put in this cage with the other birds, one or more birds started to utter Clucks. Not fast

etc.

Much slower than the usual clucks of birds held in the hand. I think that it was WH2 who uttered these clucks.

Every time one of the other birds pecked WH2, or even before, when one of the other birds seemed to have WH2 cornered, WH2 uttered 1 or 2 Chirp-squawks (probably best classified as squawks).

We had to remove WH2 after only a few minutes.

We then left the birds alone for a while.

Then we came back to the birds of the first clutch. One of them uttered OO Notes when I first approached, and the other 3 remained silent.

Then we did a little experimenting

I.

Silent when chased, at least at first (after the chase had continued for quite a long while, one of the birds in the cage — I don't know which — uttered 1 or 2 clucks). Then, when I was almost caught, it uttered a few squawks. A few seconds later, however, when it was really caught, it remained quite silent — even when struggling violently. Then we put it in the isolation cage. Remained silent there too.

II. Silent, then 1 squawk when chased, silent when caught. Then began to utter rapid clucks — and squawks while struggling in hand. Then silent again when passive.



Ammodramus cafer, Sept. 27, 1960, III

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Then we went to the cage of the chicks of the 3rd brood. Both ran silently when chased. Finally managed to corner one. It uttered ALP-chirps. Then, when we caught it, it remained silent. Silent and passive in the hand. Then uttered ALP-chirps when let go, as it ran away.

The parents of these chicks, incidentally, uttered single clucks, at fairly long intervals, when we were chasing the chicks. (I shall work the behavior of adults with ~~more~~ )

Ammodramus cafer, I

September 29, 1960  
Barro Colorado

Did a little work with the chicks of the 3rd clutch again today. Both silent when chased at first. Both uttered ALP-chirps when cornered. Also when finally caught. (I think these sounds should probably be classified as particularly high-pitched "urgent" chirps.) Both quite silent when more or less quiet in the hand. No sign of clucks yet.

When we let the second chick go, it ran away with ALP-chirps. These declined in frequency quite rapidly, but the chick still uttered single notes for at least 15 minutes after being let go. By this time the notes had declined to ordinary P's (perhaps ALP-P's).

I heard at least one of these chicks utter typical LC Notes this morning.

Ammodramus cafer, I.

October 2, 1960  
Barro Colorado

Did the usual experiments with the 2 chicks of the 3rd clutch this morning 9:30 a.m. No change in their behavior yet. Gave ALP-chirps when cornered and when caught. Then ALP-chirps when struggling in the



Ammodramus cajanae, Oct. 2, 1960, II.

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hand. Then silent when passive in hand. No Chicks yet.

Earlier this morning I heard the chicks utter LC Notes and P's, when undisturbed in cage with their parents.

For at least 10 days now, I have heard occasional adult "Tremulating Calls" (complete, 2 phases) coming from the general area of the cage of the chicks of the first clutch. They may be uttering these calls, but I have not yet been able to catch them at it.

Ammodramus cajanae, I

October 11, 1960  
Barro Colorado

I was away in Chiriqui for a month, but tested the 2 chicks of the 3rd clutch immediately upon my return this afternoon, at 3:00 p.m.

They were both silent when chased.

Then, the first one we caught uttered P's, followed by ALP's when actually grasped. Only a few notes. Very brief. Then silent in hand, both when struggling and when passive.

The second chick uttered ALP's, and then chirps when actually caught. Silent when passive in hand. ALP's and ALP-chirp's when struggling.

Ammodramus cajanae, I

October 13, 1960  
Barro Colorado

Tested chicks of 3rd clutch at 2:15 p.m.

Both silent when chased.

The first chick uttered ALP's when caught and ALP's when struggling in the hand. Silent when passive.

The second chick was silent when caught, and remained so in the



• Ammodramus cajauea, Oct. 13, 1960, I.

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~~XXXXXX~~ hand, both when struggling and when passive.

Ammodramus cajauea, I.

October 14, 1960

Barro Colorado

Tested chicks of 3rd clutch at 2:10 p.m.

Both were silent when chased.

~~XXXXXX~~ The first remained silent when caught and when held in the hand.  
Both when struggling and when passive.

~~XXXXXX~~ The second uttered ALP-chirps when caught. Silent when passive  
in hand. ALP-chirp's when struggling.

~~XXXXXX~~ (It seems very likely that we have caught the chicks in different  
order on different days of testing.)

~~XXXXXX~~ They are both well-feathered now, except on the heads. Their primaries  
are so well-developed that they can almost fly.

~~XXXXXX~~ I have not heard them utter any LC Notes since my return from  
Chiriqui on Oct. 11.

Ammodramus cajauea, I

October 20, 1960

Barro Colorado

~~XXXXXX~~ We tested the chicks of the 3rd clutch, on Oct. 18, right after lunch,  
and today right after lunch. On Oct. 18, they behaved just as before. Today,  
they were both silent when chased, silent when caught, and silent in  
the hand, both when struggling and when passive.

~~XXXXXX~~ This evening, from my house, I could hear that one of the birds of the  
clutch uttered lots of ordinary P's (just about the time of day when they us-  
ed to utter LC Notes).



Aramides cajaca, I.

October 29, 1960  
Barro Colorado

We tested the chicks of the third clutch, in the usual way, on October 23rd, 25th, and 28th, in the afternoons. On the 23rd, they were both silent throughout, except that one uttered a few ALP-chirps when caught. On the 25th, one was silent throughout, while the other uttered ALP-chirps when caught and when stringfuzz in the hand. On the 28th, they were both silent throughout.

During the night of the 27th, I heard lots of loud LC Notes coming from the cage in which were the chicks of the 3rd clutch and their parents. Almost certainly being uttered by the chicks. I then heard more LC Notes on the morning of the 28th, interspersed with bursts of P which may have been a form of RP. Again presumably uttered by the chicks. I don't know what the disturbance was that caused all this commotion. The birds shut up whenever I came close to the cage.

On the afternoon of the 28th, we took the two chicks of the 3rd clutch away from their parents, and put them in a separate, small, outside cage, about 30 ft away from their parents' cage. The chicks spent most of the afternoon after their transfer uttering long & loud LC Notes. Quite like those of young chicks, except much louder.

These chicks of the 3rd clutch are almost full-grown now, but their legs and bills are still dull (although a patch of yellow is beginning to appear on the upper mandible of one of them).

I led the only bird of the second clutch go about a week ago. It is still in the neighborhood, however.

I finally caught the birds of the first clutch Trumpeeting on the afternoon of the 28th. This Trumpeeting was quite like that of all the adu



As I have had. 2 phases. Not accompanied by any very distinctive ritualized postures of any sort. Neck just stretched upward. Head possibly inclined a little upward. All 4 birds did the Trumpeting simultaneously (although their phases were not exactly synchronized). The whole outburst was apparently provoked by the sight of the 2nd clutch bird walking by, about 10 feet away, very quietly and inconspicuously. So the Trumpeting may be hostile. The 2nd clutch bird didn't respond in any way.

The birds of the 1st clutch still utter OO Notes when I appear.

Ammodramus caajana, I

November 21, 1960

Barro Colorado

We have kept catching and testing the birds of the 3rd clutch every other day (approximately), on Oct. 30, Nov. 2, 4, 6, 9, 12, 16, and 19, with no result. Both birds always silent throughout, both when chased and handled.

They are both quite full-grown now, but their flesh colors are still very immature (their upper mandibles are just beginning to turn yellow).

Whenever we chase the birds of the third clutch, the birds of the first clutch (which are in a cage about 10 ft away) always become greatly excited. Running about and uttering loud clucks.

On November 2, I noticed that at least one bird of the first clutch was also uttering another sound in addition to clucks, while we chased the birds of the third clutch. A series of very low, muffled, rather prolonged "Oooooooonh Oooooooonh Oooooooonh..." sounds. Much lower and longer than the OO Notes. I shall call these "Booms". They are quite reminiscent of some of the notes of the ♀ Pavo.



These Booms must have been hostile. Probably at least moderate intensity. Perhaps escape predominant ???

Since then we have heard one or more of the birds of the first clutch utter Booms almost every time we have chased the other birds.

As far as I can tell, the Booms are not accompanied by any special ritualized movements or postures. Apparently uttered with bill closed.

I think that I probably heard Booms uttered by some of the birds of the first clutch at least 1 month before November 2, but I can't be absolutely sure about this.

Arremonops cajauca, I

November 22, 1960

Barro Colorado

We tested the chicks of the 3rd clutch again this afternoon, ca. 1:20 p.m. One was silent throughout, as usual. The other gave a sort of muffled, irregular Squawk when caught. They began to utter very faint Clucks when passive in hand. With bill closed, throat moving in and out. These Clucks developed gradually - from the sound of heart beats. Obviously the first stage of the Cluck pattern as a whole.

It is possible that these birds have been somewhat retarded in developing or, at least, showing the Cluck pattern because they are so shy. It is my impression that escape tends to inhibit Clucks.

The birds of the first clutch still utter both OO Notes and Clucks when I approach their cage.